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ABSTRACT

This report presents final (fifth year) results of 17 longitudinal studies on the costs and effects of providing alternative types of early intervention services to handicapped children. Part I summarizes activities undertaken by the project and outlines the contextual, theoretical, and historical factors underlying the conceptualization, design, and implementation of the studies. Part II summarizes the results of each individual study grouped into the following three categories: (1) effects of varying intensity of intervention; (2) intervention with medically fragile children; and (3) effects of involving parents in intervention. Presentation of results for studies in each category are preceded by a review of other research addressing similar issues. For each study, information is provided concerning: the comparison populations, coordinators, location, report date, study rationale, review of related research, study overview, method, intervention programs, data collection, results/discussion, and conclusions. Part III presents brief summaries of each of the studies in tabular form. Part IV describes project activities with regard to dissemination, training of graduate students and Advisory Committee meetings. Includes approximately 525 references. (DB)

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FINAL REPORT FOR PROJECT PERIOD

OCTOBER 1, 1985 - DECEMBER 31, 1990

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of the

Longitudinal Studies of the Effects and Costs of Early Intervention for Handicapped Children

Submitted to the

U.S. Department of Education

by the

Early Intervention Research Institute

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PREFACE

This document contains the final report of the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.*** This study was conducted from 1985 to 1990 by the Early Intervention Research Institute at Utah State University as a part of a contract (Contract #300-85-0173) with the United States Department of Education. Funding for the project was provided by the U. S. Department of Education as well as the National Institute of Child Health and Human Development and the Office of Maternal and Child Health of the Public Health Service. The study was initiated in the Fall of 1985. As specified by the federal government, the first subjects were enrolled in the longitudinal phase of the study in October of 1986. The study was designed to be continued through the Fall of 1990, with the expectation that another contract would be competitively awarded at that time to continue data collection efforts for a subset of the studies for an additional five years.

Because a follow-up phase to the original study has been funded by the U. S. Department of Education (Contract #HS90010001) the data, results, and tentative conclusions contained in this report should be viewed as preliminary. Additional data are being collected, and analyses continue. Furthermore, even though care has been taken to discover key punching, transcription, and computational errors, it is certain that not all such errors have been identified and corrected at this time. As work continues, more up-to-date information on any study reported in this document will be available from the Early Intervention Research Institute.

Staff members contributing to sections of this report included: Glenna Boyce, Diane Behl, Glendon Casto, William Eiserman, Colette Escobar, Linda Goetze, Nanette Gutshall, Lee Huntington, Nancy Immel, Mark Innocenti, Chuck Lowitzer, Stacey McLinden, Lance Mortensen, Matthew Taylor, Martin Toohill, and Karl White. Preparation of the manuscript was done by Mary Ellen Heiner and Vicki Anderson.

PART I. RATIONALE, DESIGN, AND ANALYSIS ISSUES RELATED TO THE STUDY

In the Fall of 1985, the U. S. Department of Education undertook a significant initiative to investigate the longitudinal effects and costs of providing alternative types of early intervention services to handicapped children. Through a competitively awarded contract to the Early Intervention Research Institute at Utah State University, planning was undertaken for a series of longitudinal studies of the costs and effects of providing alternative types of early intervention services.

Part I of this report summarizes the activities undertaken as a part of this project and outlines the contextual, theoretical, and historical factors underlying the conceptualization, design, and implementation of the studies. The details of several methodological issues which cut across studies (e.g., randomization procedures, instrumentation, economic analyses, etc.) are explained in this section so that they will not need to be repeated in the description of each individual study.

Part II of the report summarizes the results of each individual study. The 17 studies conducted have been divided into three categories for ease of presentation:

- The Effects of Varying Intensity of Intervention
- Intervention with Medically Fragile Children (each of which involved age-at-start comparisons)
- The Effects of Involving Parents in Intervention

The presentation of results for studies in each category are preceded by a review of other research which has addressed similar issues.

Part III contains a two-page summary for each of the 17 studies which summarizes in tabular form the design and results of each study. This section is intended as a quick reference to the major findings of the study. It is not intended as a complete description and is best used after reading the more complete report of each individual study.

Part IV describes the activities of the project over the five-year contract period with regard to dissemination, training of graduate students, and the meetings of the Advisory Committee.

BACKGROUND FOR THIS REPORT

The impetus for this type of a large scale research project stems from at least three sources. First, over the past 25 years, hundreds of research studies have been conducted to investigate the efficacy of early intervention programs with handicapped, disadvantaged, and at-risk children. Unfortunately, much of this research has suffered from serious methodological flaws, narrow definition of outcomes, and/or inadequately implemented interventions (Dunst & Rheingrover, 1981; Simeonsson, Cooper, & Scheiner, 1982). Most of the research which has been well done, has been done with disadvantaged children, and there are questions about the degree to which findings from research with such children should be used to make decisions about programs for children with handicaps (White & Casto, 1985). Unfortunately, there is very little credible research data which can be used to draw conclusions about what types of early intervention programs are best for which children with handicaps.

Second, during the last 20 years there has been a dramatic increase in the availability of early intervention programs for children with handicaps. This expansion is expected to continue and even increase with the 1986 passage of Public Law 99-457 which provides significant initiatives for states to mandate early intervention programs for handicapped children by the Fall of 1991. Although much progress has been made, it is evident that the lack of high-quality research for children with handicaps has been a substantial impediment to improving the quality of early intervention services for such children and their families. Furthermore, the rapid and continuing expansion has increased the need for better information about which early intervention programs are best for which children.

Third, during the last decade, resources for providing human service programs have become increasingly limited. This has led policy makers and program administrators to be more concerned about the costs as well as the effects of all human service programs. With regard to early intervention, there have been increasingly frequent questions about which types of programs are most cost-effective. Unfortunately, very little previous early intervention research has included a cost analysis component.

It was in the context of these three factors: 1) limited high-quality early intervention research for children with handicaps, 2) pressures to expand early intervention programs for children with handicaps, and 3) the almost total absence of efficacy research which includes a cost-analysis component, that the U. S. Department of Education issued a Request for Proposals (RFP) in the Spring of 1985. This RFP called for a contractor to conduct a series of experimental studies investigating the effects and costs of alternative types of early intervention for children with handicaps. The RFP stipulated that each of those studies must be a randomized experiment in which two alternative types of intervention were compared, must consider the effects of the intervention for both children and families, must analyze the costs in conjunction with the effects of the alternative types of intervention, and must be carried out in field-based settings which were representative of state-of-the-art early intervention programs.

The RFP required that one group of studies would investigate the effects of varying the intensity of the intervention program, another series would investigate variations in the age at which the comprehensive intervention program began, and a final group of studies would investigate the effects of program variation. These studies were to be done with various subgroups of children with handicaps (e.g., visually impaired, hearing impaired, severely handicapped, etc.) instead of with disadvantaged or at-risk children. The contract provided funding for a 5-year period so that the effects of intervention could be assessed longitudinally, but the money was limited to actually conducting the research and was not to be used to fund the intervention programs.

As a separate part of the contract, the recipient was also required to develop a system which could be used to describe the participating children, the nature of the intervention program, the costs, and the effects of a series of early intervention programs for handicapped children. This system was to be designed in such a way that it could be used on a regional, state, or national basis. The intent of this data collection system was that it could be used by program administrators (e.g., a state coordinator of preschool programs) to systematically and objectively describe the type of programs being offered, identify gaps in the existing system, and draw conclusions about which programs were best for a particular purpose. This component of the contract was completed at the end of the 1987-88 year. A full description of that system is included in the final report for 1987-88 (see ERIC Document Reproduction Services #ED 303972). Consequently, it is not discussed in this report.

Specifications for the contract required a series of feasibility studies during the first year (1985-86), after which the Government would decide whether it would proceed with all or part of the proposed research workscope. Based on the work done during that first year (1985-86), the Government decided to proceed with all of the work outlined in the original RFP. (A report of that work can be found in ERIC Document Reproduction Services #ED 202089). As a result of the government's decision, the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children*** were initiated in October of 1986 and continued through December 31, 1990. A subsequent, competitively awarded contract, is now in place (Contract #HS90010001) which will continue to collect data so that the long-term effects of early intervention with handicapped children can be more completely assessed.

The purpose of this report is to summarize the results of the work conducted during the five year funding period of the ***Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children***. To set a context for the main body of the report which describes the results of each study, we will briefly summarize the activities and accomplishments during each year of the project (1985-86, 1986-87, 1987-88, 1988-89 and 1989-90). We will then summarize the theoretical, conceptual, and methodological issues which undergird the conduct of the individual studies (much of the material contained in these sections has appeared previously in other reports of the project). Finally, the design and results of each individual study will be discussed.

Accomplishments During 1985-86

The primary task during the first year of the project was to identify the sites that would participate in the longitudinal studies. This task was difficult because of the constraints imposed by the original RFP. For example, since the contract funds could not be used to actually provide services, service programs had to be identified who were willing and able to contribute financial resources (often substantial amounts) to conducting the expanded services necessary for the comparative experiments. In addition, collaborators had to be willing to abide by the conditions of the contract (random assignment of children to groups, extensive data collection for participating children and families, and provision of data necessary to calculate program costs and to verify treatment implementation). Finally, the type of research called for in the RFP eliminated many potential collaborators because of the necessity of having substantial numbers of handicapped children who were available for participation in the experimental groups.

The foregoing requirements necessitated a nationwide search for projects who were interested in collaborating in the longitudinal research. Over 50 programs were contacted and almost 25 were visited during the recruitment phase of the project. Using carefully developed criteria, EIRI staff narrowed the potential participants to a final set of 16 studies which were initiated in the Fall of 1986.

Another major activity during the first year was the development, pilot testing, revision, and finalization of the various procedures and protocols necessary to implement these studies. For example, from among the hundreds of measures available for measuring child and family progress, EIRI staff selected those measures which appeared to be most appropriate for these particular studies of early intervention. Procedures also had to be developed for randomly assigning children to groups, conducting the cost-analyses, and collecting data on treatment verification. In some cases, the sites identified as collaborators needed assistance in enhancing various aspects of their program so that the research could be conducted. For example, staff worked with some programs in developing better child-find procedures, record keeping systems, inservice training programs, and child assessment and evaluation techniques.

Based on the work referred to above, a series of four feasibility studies were conducted during the 1985-86 year. Three of these studies were carried out in conjunction with a special funding initiative in the state of Illinois, and one was conducted in Salt Lake City, Utah. Each of these studies used the various procedures, data collection protocols, and management techniques that were being developed for the larger set of studies.

The purpose of these feasibility studies was to collect data that would assist the government in deciding whether it was feasible to conduct the series of longitudinal studies called for in the original RFP. The feasibility studies led to revisions of several protocols and to rethinking of some of the management strategies being considered for the larger set of studies. For example, the feasibility studies made it clear that the degree of training and monitoring that would be necessary for diagnosticians to appropriately use the Battelle Developmental Inventory would have to be substantially greater than had first been anticipated. The feasibility studies also suggested that additional work would have to be devoted to identifying instruments appropriate for assessing motor development in very young children and for assessing mother-child interaction. In many other areas, the feasibility studies yielded valuable insights which had a substantial impact on how the longitudinal studies were eventually structured.

A fourth major activity of the first year was to raise additional money that could be used to enhance various aspects of the research. From the beginning it had been clear that the money available from the U.S. Department of Education would only allow a "bare bones" research project to be conducted. Of particular concern was the limited amount of funds available for collecting outcome data for children and families, and the lack of funds available for "buying out" a portion of time of some of the staff at each of the collaborating research sites to allow them to devote the necessary time and effort to the liaison activities necessary in this type of research.

During the first year (1985-86), EIRI staff devoted substantial amounts of time and effort to raising additional funds. Hundreds of private foundations were contacted, funds from the Utah State Legislature were requested, and work was initiated with several other federal funding agencies. As a result of these efforts, an ongoing $50,000 per year appropriation was received from the Utah State Legislature, a number of small donations were obtained from private companies and foundations, and a substantial amount of money was obtained from the National Institute of Child Health and Human Development, and the Office of Maternal and Child Health. The money obtained from these efforts dramatically increased the amount of data that could be collected as a part of the research and enhanced the interpretability of those data because of the expanded treatment verification and site liaison activities.

Accomplishments During 1986-87

Although the contract did not call for the studies to begin until October 1, 1986, when the second year of the contract actually began, it was necessary to begin several of the studies prior to that time because of the service year calendar of several of the collaborators. In other words, for some of the collaborators, the service year began in August or September and in order to have children randomly assigned to groups, it was necessary to begin the experiment at the beginning of their service year instead of part way into it.

From the beginning it was clear that the continuation of any one of the studies for the full time period of the contract would depend on a number of factors which were not under the control of EIRI or the service provider. For example, a number of the programs depended on state appropriated money for both their basic program and the expanded program necessary for the research comparisons. If the state cut funding for the service program, the research project was jeopardized. In other cases, the recruitment of subjects did not proceed as projected and the success of the project was called into question (e.g., in several studies with low birthweight babies with intraventricular hemorrhaging (IVH), we found the incidence to have dropped substantially from previous years). Because the successful implementation of any given study was in part dependent on factors which we could not control, we continued to recruit additional sites and maintained several alternative research sites.

During the second year of the project (1986-87), the following activities occurred. Eighteen different longitudinal studies were implemented, these included several changes from those studies reported in the baseline report. For example, based on much lower than expected recruitment at participating hospitals in New Orleans, we decided to only conduct one study for children with intraventricular hemorrhage instead of the two originally planned in conjunction with Louisiana State University. The second LSU/IVH study was replaced with a similar population of children in the Salt Lake City area. For similar reasons, two studies at the Alabama Institute for the Deaf and Blind were dropped based on much lower enrollment of subjects than anticipated.

The basic procedures for conducting the studies were developed during the initial year of the project. However, during 1986-87 it was evident that several areas needed further work, particularly the procedures for recruiting, training, and monitoring diagnosticians; treatment verification; and cost-data collection. Work in these areas proceeded simultaneously with the implementation of the studies.

During the 1985-86 year, preliminary approval was obtained from the National Institute of Child Health and Human Development (NICHD) and the Bureau of Maternal and Child Health (MCH) for supplementing the Department of Education contract; however, substantial additional work was necessary to finalize those arrangements. Negotiations were completed in April of 1987 with NICHD, and in July of 1987 with MCH.

A part of the workscope specified in the RFP was the provision of training to graduate students. During 1986-87, 19 graduate students and one post doctoral fellow were employed by the institute. These individuals participated in all aspects of the work commensurate with their skills and experiences.

Accomplishments During 1987-88

During 1987-88, institute staff continued the conduct of the studies initiated the previous year. Individual site coordinators worked with each of the study sites to oversee the implementation of alternative interventions to ensure that alternative interventions were appropriately implemented. Periodic site visits and weekly telephone contacts were made to each of the sites. A formal onsite evaluation visit was made to each site using a structured format. The site coordinators arranged for the collection of treatment verification data and arranged with the liaison person at each site for the collection of pre- and posttest data.

Data collection required the recruitment, training, and monitoring of diagnosticians in each of the sites. The site coordinators also worked with economists at the institute and with site liaisons to collect the necessary data for cost analyses. The management of the research comparisons at each of the sites required continual attention to make sure that necessary data were being collected and that alternative interventions were being implemented as planned. As outcome data were collected, site coordinators were also responsible for cleaning, double checking, and entering the data into the computer files.

Due to difficulties in recruiting the number of subjects they had originally expected, additional sites were dropped near the beginning of the 1987-88 year. This necessitated the recruitment of additional sites. As a result of these recruitment efforts, negotiations were conducted with sites in Columbus, Ohio; Salt Lake City, Utah; and Chicago, Illinois. Substantial additional work was done during the year to identify an additional hearing impaired site with contacts being made in Texas, Florida, South Carolina, California, and Michigan. Although people in each of these sites expressed a great deal of interest in participating in the longitudinal research, the unavailability of sufficient funds for the service component of the research prevented any of them from becoming involved.

A longitudinal study of this nature requires ongoing procedural refinements. During the 1987-88 year, particular attention was devoted to measuring the degree to which parents are involved in early intervention programs. A number of alternatives were tried including telephone interviews, interviewer ratings, parent reports using postcards, and time diaries. None of these were successful. Procedures for the estimation of costs were also refined during the year. It was discovered that site liaisons required substantially more assistance than originally expected. Thus, procedures were altered to account for the provision of such assistance. Effort was also devoted to refining the scoring systems for parent-child interaction.

Because of the extensive data being collected at each study on child and family functioning, demographic characteristics, and treatment verification variables, a number of different kinds of analyses were possible. During the 1987-88 year, samples sizes in many of the sites became large enough so that these analyses could be initiated. Thus, the efforts of research staff began to shift from the recruitment of sites and implementation of research to conducting the analyses.

A part of the workscope specified in the RFP is the provision of training to graduate students. During the 1987-88 year, 20 graduate students and one postdoctoral fellow were employed by the institute. These individuals participated in ways commensurate with their skills and experience in all aspects of the work described in the remainder of this report.

An important part of the institute's workscope was to disseminate information to professionals, parents, policymakers, and administrators. During the first several years of the project, dissemination was limited because the actual research had not yet been initiated. During the 1987-88 year, 36 journal articles, chapters in books, or manuscripts were produced; and 50 presentations were made at professional meetings.

Accomplishments During 1988-89

1988-89 was the fourth year of the **Longitudinal Studies**' contract, and the third year since most of the studies were initiated. The primary emphasis during this year was on continuing the implementation of the individual studies. Individual site coordinators continued to work with each of the study sites to oversee the implementation of alternative interventions and to ensure that the experimental conditions were appropriately implemented. Periodic site visits and weekly telephone contacts were made to each of the sites. In most cases, another formal onsite evaluation, using a structured format, was conducted. Several of these onsite evaluations included independent evaluators who were not associated with Utah State University.

Site coordinators also arranged for the collection of treatment verification data and arranged with the liaison person at each site for the collection of pre- and posttest data. A significant amount of turnover occurred with the diagnosticians from the previous year. This turnover necessitated further recruitment, training, and ongoing monitoring of diagnosticians at each of the sites. The management of the research comparisons at each of the sites required ongoing attention to make sure that necessary data were being collected and that alternative interventions were being implemented as planned. As outcome data continued to be collected, site coordinators were responsible for cleaning, double-checking, and entering the data into the computer for subsequent analyses.

Obtaining money for the provision of alternative intervention services emerged as a major responsibility of site coordinators during this year. A number of the sites had been receiving federal funding for providing the early intervention program which was a part of the research (e.g., LSU IVH and South Carolina IVH), and that money ended during this year. In other sites, state money had been provided and was shifted to other programs, reduced, or discontinued. The individual circumstances varied from site to site, but substantial amount of effort was needed to maintain funding for interventions in each of the sites.

Another issue which emerged this year was the necessity of efforts to minimize attrition. Children who had completed interventions and moved to other parts of the country had to be located wherever possible and tested at appropriate times. In other cases, children moved within the same geographic area, and had to be relocated before testing could be done. A number of parents have simply lost interest in the project and efforts were made to persuade them to continue participation. Having liaison people located at each of the sites was critical to the success of this process. In many cases, the money obtained from the Office of

Maternal and Child Health allowed us to buy out a portion of a person's time who was located at the site. In those cases where we were able to buy out the time of an enthusiastic and committed person, problems with attrition and ongoing funding with the project were substantially reduced.

At the beginning of the 1988-89 year, we were able to finalize the arrangements necessary to add a site with a school district in Salt Lake City (Jordan Intensity Study) in order to replace one of the sites lost earlier. Final arrangements were also made to begin providing intervention to children in the Columbus Children's Hospital Site. Thus, there were two new sites that came into operation during this year. The biggest problem in operating the **Longitudinal Studies** has remained the securing of funds for providing alternative services.

During 1988-89 there was continued need for refinements and additions to some of the projects' procedures. For example, several of the sites implemented ecobehavioral observation techniques to obtain additional information about the types of activities in which interventionists and children were engaged and how those activities related to child progress. The analysis of parent-child interaction data continued to require substantial effort. Our approach to the scoring of parent-child interaction was to secure assistance from some of the people in the field who have developed the most widely-used systems (Dale Farran, Jerry Mahoney, and Kofi Marfo). At the end of 1987-88, tapes were sent to each of these people for coding according to their systems. Preliminary analyses from those codings were complete but much work remained. Efforts were also devoted to refining the measures of child health for all children and the measure of motor functioning for children in the IVH studies. Finally, we began preparations to shift from using the Battelle Developmental Inventory (BDI) to the Woodcock-Johnson Battery for those children who had become too old for the BDI to be used appropriately. A significant addition to data collection during 1988-89 was the collection of data from teachers of children who enrolled in public school programs. The few sites where this was done during 1988-89 provided valuable lessons that were critical in subsequent years as more children from other sites "graduated" into public school programs.

The training of graduate assistants and their involvement in the longitudinal studies continued as an important part of the contractual workscope for this project. During 1988-89, 14 graduate students from special education and psychology worked on the **Longitudinal Studies**. Their responsibilities included supervision of data collection and coding, telephone interviews with parents, data analysis and interpretation, and report writing. In addition to these students who were employed 20 hours per week, an additional 23 graduate students from Utah State University and other universities were trained and certified to do educational assessments of participating children. These students were paid on a daily rate according to the number of assessments they completed.

As more data were collected, project staff also increased their activity in various dissemination activities. During 1988-89, many presentations were made at professional meetings, and several articles reporting the results of the studies to date were submitted to journals.

Accomplishments During 1989-90

1989-90 was the fifth and final year of the **Longitudinal Studies'** contract, and the fourth year since most of the studies were initiated. Individual site coordinators continued to work with each of the study sites to oversee the implementation of the alternative interventions and to ensure that the interventions were implemented appropriately. Periodic site visits and regular telephone contacts were maintained with each of the sites. In most cases, another formal onsite evaluation, using a structured format, was conducted.

Site coordinators also oversaw the collection of treatment verification and outcome data at each of the sites. Because of turnover in diagnosticians, it was necessary to continue to train a few diagnosticians and monitoring procedures were continued to ensure high-quality assessments. Management of the experimental comparisons at each of the sites required ongoing attention to make sure that appropriate data were collected and that the implementation of alternative interventions were continuing as planned. The early intervention programs in a number of the sites were no longer operational for children participating in the research since these children had "graduated" into public school programs. Arrangements were made to continue to follow those children and collect data annually. As outcome data were collected, site coordinators were responsible for cleaning, double checking, and entering the data into the computer for subsequent analyses.

The important task of minimizing attrition among participating child and families continued as a major responsibility of site coordinators. Children who had completed early intervention programs and moved to other parts of the country were located whenever possible and tested at appropriate times. In other cases, children had moved within the same geographic area and had to be relocated before testing could be done. In most sites, the efforts to relocate children have been successful, and the posttest data included in this final report often includes more children than the posttest data from the 1988-89 year. Unfortunately, a number of parents have simply lost interest in the project and declined to participate in spite of our best efforts to persuade them to continue. The importance of having liaison people located at each of the sites was emphasized in this process. Money obtained from the Office of Maternal and Child Health allowed us to purchase a portion of a person's time at many of the sites, and this substantially aided in the efforts to obtain a data set which was as complete as possible.

The training of graduate students and their involvement in the **Longitudinal Studies** continued as an important part of the contractual workscope for the project. During 1989-90, 12 different graduate students from special education, family and human development, economics, and psychology were actively involved in the workscope of the **Longitudinal Studies**. Their responsibilities included supervision of data collection and coding, telephone interviews with parents, data analysis and interpretation, and report writing. In addition to these students who were employed an average of 20 hours per week, many additional graduate students from Utah State University and other universities were trained and certified to do educational assessments as a part of the **Longitudinal Studies'** workscope. These students were paid according to the number of assessments they completed.

The activities of the staff regarding dissemination of project results also increased. As more studies have had complete data, the results of these studies have been written and presented at national meetings and submitted to journals for publication. Although the funding for this project ended December 31, 1990, it is anticipated that many subsequent publications and presentations at national and international meetings will be done to report the results of these important studies.

The remainder of Part I of this report contains sections addressing the following issues:

- An analysis of the early intervention efficacy research which had been conducted prior to the initiation of this project;
- The rationale for conducting randomized experiments in early childhood special education;
- The design and general procedures for conducting the studies including a discussion of the theoretical/conceptual framework, the subject assignment procedures, the data collection procedures, the instrumentation, procedures used to verify the implementation of the intended interventions, and the techniques for conducting economic analyses with the studies;
- The strategies and activities used to recruit and select collaborators to participate in the studies.

PREVIOUS RESEARCH ON THE EFFICACY OF EARLY INTERVENTION WITH HANDICAPPED CHILDREN

The design and conduct of the **Longitudinal Studies** was based on a comprehensive review of the early intervention efficacy literature available at the time the studies were initiated. Although that review is now outdated because many other studies have been conducted in the last 5 years, a proper interpretation of the studies reported in this volume depends on understanding what could be concluded from the research available at that time. This section summarizes the review of research literature completed prior to the initiation of the **Longitudinal Studies**. Updated research reviews pertaining to the studies included as a part of this project are included later. At the time the **Longitudinal Studies** were initiated, and continuing to the current time, the term "early intervention" encompasses a wide variety of medical, educational, and psychological treatments such as vestibular stimulation for cerebral palsied children, language therapy for hearing impaired children, auditory and kinesthetic stimulation for low birthweight infants, educational programming for disadvantaged children, instruction in self-help skills for mentally retarded children, and diet therapy for hyperactive children. Intensity of programs range from a few seconds of vestibular stimulation once per day for a week, to 40 hours per week of intensive educational programming beginning at birth. Objectives range from prevention to complete resolution or amelioration, to slowing the rate of degeneration, to helping families to cope. The wide range of intervention procedures, target populations, intensities, and objectives makes it clear that there are no simple answers to the question, "Is early intervention effective?"

From the early 1970s, the number of early intervention programs for children who are disabled, at-risk, or disadvantaged, increased dramatically; most people agree that it will continue to increase as a result of the passage of P.L. 99-457 in 1986. Exact estimates are difficult because of problems in defining exactly what early intervention is, but it is safe to say that millions of children are served each year at an annual cost of billions of dollars. As the frequency of early intervention programs increased, questions about the efficacy of early intervention also increased. Such questions generated thousands of articles and hundreds of research studies, and many promises were made to parents, legislators, and educators. Unfortunately, the data from early intervention efficacy research have been somewhat discrepant. For example, there has long been agreement among practitioners that early intervention promises significant resolution to some of the most persistent and expensive problems which educators face. According to Jordan, Hayden, Karnes, and Wood (1977):

> Programs providing early educational and therapeutic programming to meet the needs of young handicapped children and their families are reducing the number of children who will need intensive or long-term help...with early help, the sooner the better, these children can often function at higher levels than has been dreamed possible in prior years. (p.26)

However, the benefits of early intervention have not been universally accepted. As Hodges and Sheenan (1978) pointed out:

> No consistent picture of success emerged from the early childhood education efforts of the 1960's. Although modest or robust immediate gains from structured programs were frequent, just as frequently, these gains eroded after the children left the experimental program. (p. 4)

Even though the results of individual research studies should guide policy and practice, early intervention efficacy research, when considered as a total body of evidence, was somewhat confusing. Some researchers reported success; others, failure. Some suggested that early intervention was effective, but only for specific subgroups of children. Thus, even though the concept of early intervention was endorsed by individual practitioners and state and federal funding agencies (DeWeerd & Cole, 1976; Swan, 1981), the research evidence was not clear. Even more important, the factors which account for variation in research results had not been identified.

Because of conflicting opinions about what can be concluded from previous early intervention research, it was decided that the design of the **Longitudinal Studies** should be based on a thorough and systematic analysis of the existing research.

Procedures

Our approach to answering the question, "What can be concluded from exiting research about the efficacy of early intervention?" can be explained best by considering the following six steps which are generally included in what has come to be known as the scientific method of inquiry:

1. Delimit the question to be asked;
2. Examine previous efforts to answer the same or related questions;
3. Develop research questions or hypotheses;
4. Define and select an appropriate sample from which to collect data;
5. Collect data on relevant variables for each subject in the sample;
6. Analyze the data and draw conclusions about research questions.

Two critical attributes of the scientific method of inquiry which apply to all the steps just mentioned are: (1) the procedures used must be explicit and replicable, and (2) results should be accepted only if replicated and confirmed by independent investigators. Although the paradigm has not been used often in conjunction with integrative reviews of the literature, there is no reason why it should not be just as useful in such efforts as it has proven to be in conducting primary research.

Delimiting the question. In delimiting the questions which would guide our investigation, we cast a deliberately broad net. Our goal was to critically examine all experimental studies of interventions that began before 66 months of age with children who are disabled, disadvantaged, and at-risk. We defined children with disabilities following the guidelines distributed by the U.S. Department of Education under PL 94-142. At-risk children were defined as those who had suffered from trauma surrounding birth; disadvantaged children were defined as those with low socioeconomic status. With the exception of surgical or dietary interventions, we included all educational, psychological, or therapeutic interventions which presented data about an intervention designed to (1) prevent the onset or further progression of a disability, (2) produce actual improvement in the functional ability of the child, or (3) provide support in situations in which a handicap was already established.

Reviewing previous work. We began our investigation by critically examining 52 previous reviews of the early intervention efficacy literature. (See White, Bush, & Casto, 1985-86 for a complete report of this analysis.) The analysis identified primary research studies to be included in our review and guided our thinking about methodological approaches and the variables which needed to be considered.

Generating hypotheses. By analyzing previous reviews, we also generated hypotheses that needed to be tested, as summarized in Table I.1. Previous reviewers consistently cited a number of variables as being associated with intervention effectiveness, such as age at which intervention begins, degree to which parents are involved, intensity of the intervention, and many others. For example, 29 of the 52 reviewers cited parental involvement as a mediating variable, and 26 of the 27 who drew conclusions about the effects of parental involvement concluded that more parental involvement was directly associated with early intervention efficacy. Alternatively, 10 reviewers cited socioeconomic status of the family as an important mediating variable--7 of whom drew conclusions about how this variable affected intervention efficacy. However, only 4 of 7 agreed that intervention was more effective with economically deprived children, and 3 concluded that socioeconomic status is unrelated to intervention efficacy.

Selecting a sample from which to collect data. The analysis of previous reviews proved to be the best source of identifying studies to be included in our analysis. We also conducted an extensive computer-assisted bibliographic search, sent letters to colleagues to identify fugitive literature, and examined references to efficacy studies in articles previously obtained. Less than 15% of the studies thus far included in our analysis were identified in the computer-assisted bibliographic

Table I.1

Most Frequently Cited Concomitant Variables in Reviews of Early Intervention Efficacy Research

Variable	No. of Reviewers	Most Frequent Conclusions (Ratio of reviewers who drew conclusions that agreed)	
Parent Involvement	29	More is better	26/27
Age Intervention Begins	27	Earlier is better	18/24
Duration/Intensity	22	Longer/more intense is better	12/17
Degree of Structure	19	More structure is better	16/17
Training of Intervenor	14	More is better	7/7
Continuity with Public School	13	Enhances intervention	12/13
Type of Curriculum	13	No one type is better	7/10
Setting	11	Home is better	4/8
Socioeconomic Status	10	More deprived children do better	4/7
Individualization	8	More is better	4/4
Child/Teacher Ratio	8	Lower is better	7/7

search which examined 8 data bases and over 200 terms and combinations of terms. (Casto, White, & Taylor, 1983, explain the specific procedures used in the computer-assisted search.)

Collecting data for each study. As each potential study was obtained, it was screened to determine whether it met the criteria for inclusion; those that did were coded by one of the project team members. We attempted to collect data about approximately 90 variables from the following five categories for each study. First, we coded information about the ***type of subjects*** involved in each study. For example, were they handicapped, at risk, or disadvantaged? How old were they? In what kind of families did they reside? At what level were they functioning prior to the initiation of intervention? Second, the ***specific intervention*** used was described by coding such variables as the duration of the intervention, the identity of the primary intervenors, and the setting in which the intervention took place. Third, we coded information about the ***design of the study*** including a rating of the study's methodological quality based on an analysis of the Campbell/Stanley threats to internal validity (Campbell & Stanley, 1966) in combination with the type of design being used. Fourth, we coded information about the ***outcomes that were assessed***, including the domain of the outcome, who collected the data, and how it was collected. Finally the ***results of the each study*** were computed by taking the mean difference between the groups divided by the standard deviation of the control group's scores (which we defined as an "effect size").

By converting all results to such effect size measures, a common metric was created so results could be compared across studies which used different ways of measuring IQ, socio-emotional functioning, or parental attitudes. Since outcomes were on a common metric, estimates of program impact could be combined with the information described above about domain of outcome, methodological quality of study, type of subjects used, and nature of the intervention, to compare results from different studies addressing similar questions. Each variable was operationally defined in a set of written conventions; explicit procedures were outlined for coders to follow. Because multiple coders were involved, frequent reliability checks were done, and coders achieved more than 85% agreement for all the variables reported.

Multiple effect sizes were coded for the same study if they added unique information, such as information about language competence versus adaptive behavior or immediate versus long-term data. To prevent giving undue weight to studies that administered many tests, only one effect size was coded for each domain of outcome for any 12-month period of elapsed time. In other words, if a study administered two different IQ tests to the subjects at the conclusion of the study, only one was used in our analysis.

Analysis and interpretation of results. The sixth step of the scientific method is to analyze and interpret the data using replicable procedures. A variety of analytical approaches were used. For example, we hypothesized that if parental involvement were positively associated with intervention effectiveness, then those treatment vs. no-treatment studies that heavily involved parents should yield larger effect sizes on the average than those treatment vs. no-treatment studies that did not involve parents. If it is generally true that involvement of parents results in more effective interventions, those differences should remain when the analysis is limited to different subsets of the data. Using this rationale, we computed descriptive statistics for the total data set and then those studies we considered to be the best quality. We looked at immediate effects vs. long-term effects and considered the results of those comparisons when different domains of outcome were considered, such as IQ versus motor development versus parental outcomes.

Finally, and perhaps most important, we examined the results of those few studies that made a direct within-study comparison of high versus low levels of parental involvement. For example, some of the most direct evidence about the effects of parental involvement came from a study in which a center-based program randomly assigned children to a group in which parents were highly involved, or to a group in which parents were involved in a minimal extent, with the center-based program continuing in both groups. Unfortunately, there were relatively few of these "A" versus "B" studies for any given question. The combined results of such "triangulation methods" allowed us to be much more confident about the robustness of our conclusions concerning the different hypotheses investigated.

Results of the Integrative Review

The results of this systematic review were both enlightening and provocative. They have confirmed some common accepted positions, called others into question, and identified the almost total absence of empirical data for either supporting or refuting others. Because the total data set is so voluminous, we note here only those parts of the data which were instrumental in designing the **Longitudinal Studies** reported in the remainder of the volume. (More detailed summaries are given by Casto et al., 1983; White & Casto, 1985.)

CHARACTERISTICS OF THE DATA SET

At the time the **Longitudinal Studies** were initiated, the data set consisted of 2,266 effect sizes from 326 different studies. Data from experimental/control studies, A versus B studies, and single-subject design studies were analyzed separately because of the fundamentally different questions they address. There were 1,121 effect sizes from intervention versus control studies. Most of those (906) were from studies with disadvantaged children, 215 were from studies with handicapped children, and 85 from studies with medically at-risk children. The majority of effect sizes from the handicapped population came from studies which considered the effects of intervention with either mentally retarded children or with groups of children exhibiting a mix of handicaps, but predominantly with mild to moderate mental retardation.

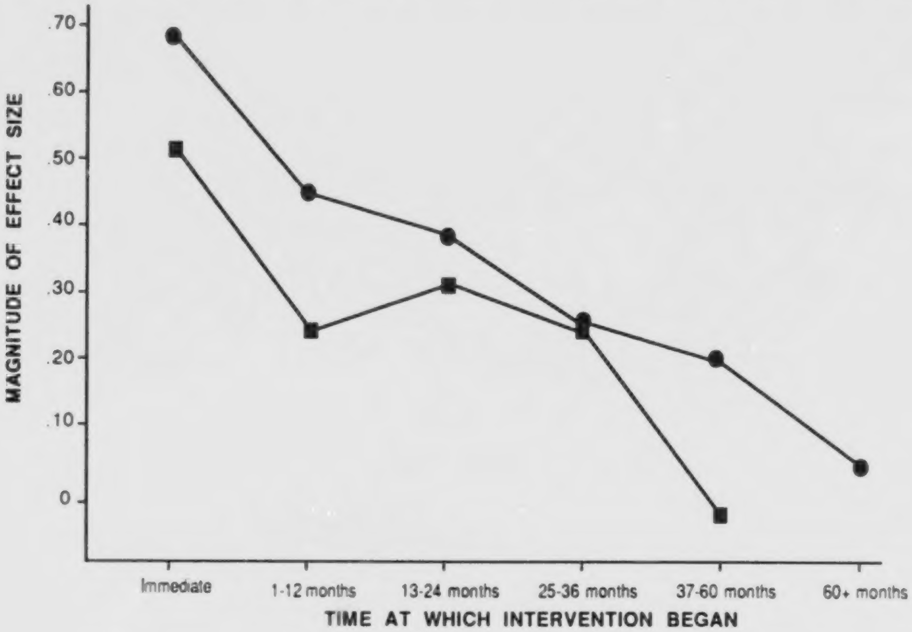
Included in the data set were 984 effect sizes from intervention A versus B studies which have examined such questions as earlier versus later intervention, intervention intensity, and degree of parental involvement. We also examined the results of 76 single-subject design studies, most of which have focused on increasing social interaction, correcting conduct disorders, or enhancing language competence.

The data set included studies reported from 1937 to 1984, with 70% of them from 1970 and after. Most of those studies were reported in educational or psychological journals, but significant numbers came from medical journals, books, unpublished documents through ERIC, and government reports. IQ was the most frequently measured outcome, accounting for over 40% of all outcomes. There was also substantial reporting of language, academic functioning, and motor functioning, but relatively scarce consideration of social-emotional growth or family outcomes. Over 60% of effect sizes were measured immediately at the conclusion of intervention, and only 11% were measured more than 36 months after intervention concluded--all of those with disadvantaged samples.

OVERALL EFFECTS OF INTERVENTION

We have considered the evidence about early intervention effectiveness separately for studies done with disadvantaged, at-risk, and handicapped children because of our belief that the children in each group are so different that combining the data would be misleading. Unfortunately, in many previous reviews of the early intervention efficacy literature, conclusions about the effects of a particular type of intervention for handicapped children have been based primarily on data from studies with disadvantaged children (see White et al., 1985-86). Although there is certainly some limited applicability for certain issues, the general practice is highly suspect.

Most of the available evidence about immediate and long-term benefits of early intervention is for disadvantaged children. As shown in Figure I.1, the best estimate of the immediate effect of early intervention for disadvantaged children is approximately one-half a standard deviation. In other words, for IQ measurements, this represents a gain of about 8 points, for motor functioning an improvement from the 30th to the 50th or from the 10th to the 22nd percentile, for reading achievement at the second grade a gain of approximately 10 months of reading. Those are substantial effects that are of obvious clinical importance. The magnitude of these immediate effects is similar for every domain and, generally speaking, for programs



─●─	# ES's	546	110	77	28	53	82
All studies	# of studies	(99)	24)	(24)	(7)	(9)	(7)
─■─	# Es's	153	21	23	15	13	
Good studies	# of studies	(31)	(9)	(10)	(6)	(6)	

Figure I.1: Average effect sizes for outcomes measured at various times following completion of the intervention for studies with disadvantaged children.

using different philosophical approaches conducted in different settings with involvement of different types of intervenors.

Over time, there is a clear tendency for the measurable effects of intervention with disadvantaged children to be substantially reduced. Several caveats are important in interpreting that data. First, when the results are limited to studies of good methodological quality, they are based on relatively few data, and there are some exceptions to the tendency for data to wash out over time. For example, the Perry Preschool project (Berrueta-Clement et al., 1984), which was conducted with disadvantaged children, was a well-designed study which reported substantial effects for early intervention on variables such as high school graduation rates, employment, and teenage pregnancy rates. It is also important to point out, however, that there were other reasonably well-designed studies that failed to find long-term effects in some of the same areas.

A second caveat is that the presently available long-term data are predominantly IQ and academic achievement data. As more studies collect data such as that reported in the Perry Preschool project, a different picture may emerge.

A third problem is that many people mistakenly assume that long-term effects are essential in demonstrating the efficacy of early intervention. As an example of how such thinking may be incorrect, consider a hiker stranded in the mountains during a winter blizzard. The hiker stumbles across an unoccupied cabin with enough fuel for only one day. When he arrives, he is very cold. Thanks to the firewood he finds he is soon warm and comfortable. The next day the blizzard continues, and he becomes cold again. Few would argue that there was no benefit for him in being warm for one day, even though there was not enough fuel to sustain the warmth. If the only object of early intervention is to permanently change the measured IQ of those children, then these data are discouraging. However, the abundant evidence for various short-term benefits should not be ignored.

For children with handicaps, as shown in Figure I.2, the data is much easier to interpret because there was so little of it. Unfortunately, in contrast to data about the efficacy of early intervention with disadvantaged children in which 25% of the available data came from studies of high methodological quality, only 16% of the data for handicapped children came from studies of high methodological quality. Furthermore, there was no follow-up data collected more than 12 months after the intervention was completed from studies of high methodological quality. The best estimate for immediate effects is about .40 of a standard deviation. However, this estimate is based on only 20 effect sizes from 11 different studies. The estimate of program impact when all studies are included is almost double (.72), suggesting that some of the perception about the magnitude of benefits for children with handicaps is based on data of questionable validity. However, the fact remains that there was evidence of a strong and replicable immediate effect for children with disabilities based on studies of only good methodological quality. Unfortunately,

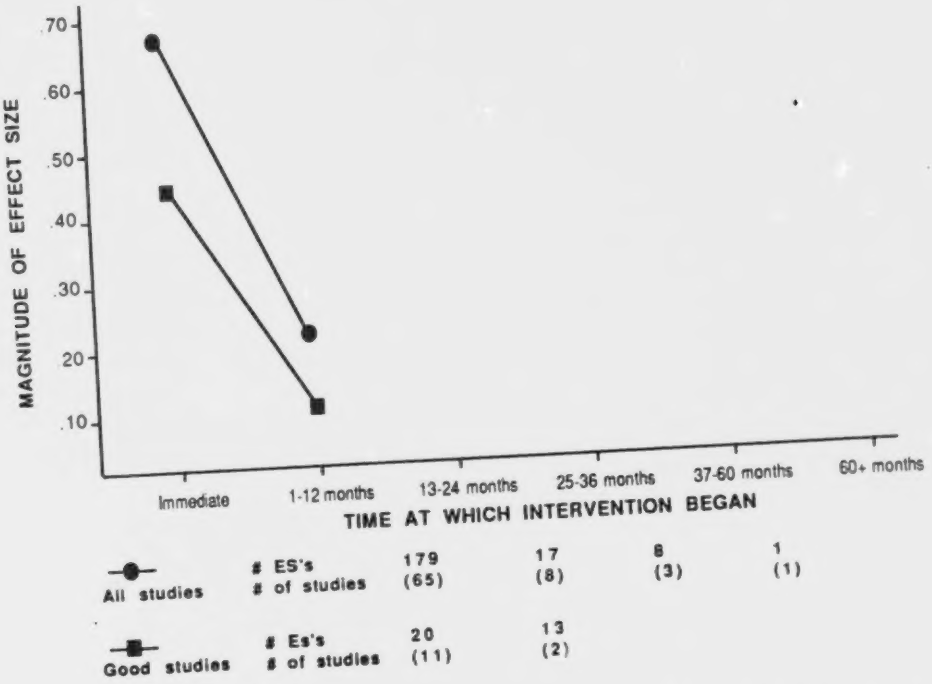


Figure I.2. Average effect sizes for outcomes measured at various times following completion of the intervention for studies with children with handicaps.

those who claimed that early intervention for handicapped children results in long-term impact prior to 1985 were arguing in the absence of data.

EFFECTS OF MEDIATING VARIABLES

As noted earlier, White et al. (1985-86) identified a number of mediating variables suggested by previous reviewers as contributing to the effectiveness of early intervention. Data from our analysis of previous research were used in determining whether these frequently advocated positions could be empirically supported.

Involvement of parents in intervention programs. One of the most frequent conclusions in the early intervention efficacy literature is that programs which involve parents are more effective than programs which do not (Bronfenbrenner, 1974; Comptroller General, 1979; Goodson & Hess, 1975; Hewett, 1977; Wiekart, Bond, & McNeil, 1978). Although intuitively logical, we were unable to find strong empirical support for this position prior to the initiation of these studies. As shown in Table I.2, when values are adjusted for age at which intervention began, time of measurement, and quality of dependent variable, the average of 684 effect sizes from 80 studies in which parents were not used at all or only used to a minor degree was .42. The average of 200 effect sizes (ES) from 27 studies in which parents were used as the major or only intervenor was .41. When effect sizes are limited to only high-quality studies, there is still very little difference between programs that use parents extensively and those that do not.

Similar results were obtained when data were examined regarding whether the program was center-based, home-based, or home- and center-based combined; whether parents or parents and children were the target of the intervention; and the degree to which the intervention program intended to involve parents.

The most direct information about the effect of parental involvement was obtained from nine studies which had made direct comparisons between different levels of parental involvement (Abbot & Sabatino, 1975; Bidder, Bryant, & Gray, 1975;

Table I.2

Average Effect Sizes for Different Levels of Parental Involvement

		All Studies			Good Studies		
Type of Handicap	Parent Intervention	$\overline{ES}$	S_{es}	N_{es}	N	$\overline{ES}$	N_{es}
Disadvantaged	Minor or not at all	.52	.03	684	80	.40	171
	Major or only	.42	.04	200	27	.51	54
Handicapped	Minor or not at all	.72	.07	137	48	.38	17
	Major or only	.59	.09	70	27	.43	6

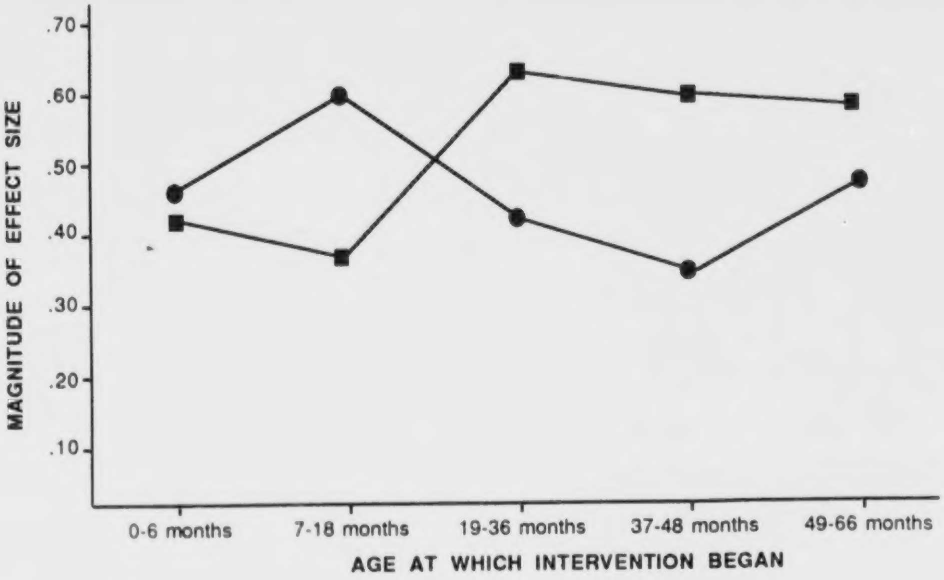
[a] *Values are adjusted for differences in quality of outcome measure and time of measurement*

Gordon, 1969; Karnes, Teska, & Hodgins, 1970; McCarthy, 1968; Miller & Dyer, 1975; Nedler & Sebra, 1971; Radin, 1971; Ramey & Bryant, 1983). When all 134 effect sizes from these studies were considered, there is a slight advantage for programs which involved parents more extensively (ES = .08). However, these findings are heavily influenced by the Gordon (1969) study, which showed an average advantage of .18 for interventions which involved parents. Although the methodological quality of the Gordon study is quite good, many of the ESs from his study which compared different levels of parental involvement were confounded with age at start, program duration, and setting. Thus, the results from Gordon (1969) should be viewed cautiously. The other eight studies yielded an average effect size of -.06 (i.e., in favor of programs which did not involve parents).

Taken together, these data suggest that early intervention programs that involve parents extensively can be effective, but it did not appear that they were any more effective than programs which did not involve parents.

Admittedly, this was counter to the intuitively logical position advocated at that time by many people. Before drawing conclusions about whether parents should be involved in early intervention programs, it is important to note the limitations of the available data. First, most of the arguments in support of involving parents in early intervention programs have come from studies done with disadvantaged children (e.g., Bronfenbrenner, 1974; Gordon, 1969; Rescorla, Provence, & Naylor, 1982). These children often come from large families with high incidences of single parents, poverty, and other stressors, and low levels of parent education--all of which may hinder effective parent participation. Thus, it may be that effective tests of parent involvement have not been done. Second, many of the outcomes included in this analysis (over 40%) are from measures of IQ. It may well be that the involvement of parents leads to gains in other areas which simply have not been investigated. Finally, very few of the effect sizes (less than 2%) came from studies in which the investigators verified that parents were actually involved to the degree intended. Thus, it may be that some investigators were examining intended rather than actual parental involvement. These caveats notwithstanding, there were no data at the time the **Longitudinal Studies** were initiated to confirm the widely held belief that involvement of parents leads to more effective early intervention.

Age at which intervention begins. Another position which was frequently stated in the early intervention literature at the time these studies were initiated was that the earlier the child is involved in a program, the more effective the program will be (Bronfenbrenner, 1974; Comptroller General, 1979; Garland, Swanson, Stone, & Woodruff, 1981). In spite of the popularity of this position, the analyses conducted just prior to the interaction of the **Longitudinal Studies** provided only meager empirical support from intervention versus control studies. As shown in Figure I.3, average effect sizes for studies comparing experimental with control group children beginning at different ages were very similar after adjustments were made for time at which the outcome was measured and quality of the dependent variable.



		0-6 months	7-18 months	19-36 months	37-48 months	49-66 months
—●— All studies	# ES's # of studies	158 (18)	79 (17)	110 (19)	226 (25)	315 (34)
—■— Good studies	# Es's # of studies	73 (8)	22 (5)	7 (4)	88 (11)	37 (17)

Figure I.3. Average effect sizes for interventions begun when children were at different ages.

As shown in Table I.3, the effect sizes (ES) from five studies which made direct comparisons of starting children at two different ages with all other variables held constant (Braun & Caldwell, 1973; Caldwell & Smith, 1970; Gordon, 1969; Jason, 1977; Morris & Glick, 1977) showed .04 of a standard deviation advantage for those children who begin later. Other studies have examined the effect of age at start but have been substantially confounded with other variables such as duration of setting (Beller, 1969; Gordon, 1979; Scott, 1974; Strickland, 1971). These "confounded" studies show an average ES of .16, favoring children who began earlier.

Table I.3

Average Effect Sizes for Within-Study Comparisons of Age at Which Intervention Begins

	ES	S_{es}	N_{es}
Effect Sizes From Unconfounded Studies	-.04	.08	17
Effect Sizes Confounded with Other Variables (e.g., intensity, setting)	.16	.06	101

[a] *Data based on eight studies*

Taken together, these data raised questions about the commonly held position that "earlier is better." Unfortunately, very little evidence was available at the time the **Longitudinal Studies** were initiated, and most was for disadvantaged rather than handicapped children. Furthermore, no direct comparisons came from studies with high ratings of methodological quality. Most disturbing is that in spite of the frequently stated position that "earlier is better," very few empirical studies have even addressed the issue of time at which intervention begins. These findings supported the need to conduct research such as that outlined for the **Longitudinal Studies**.

Conclusions from Previous Research

The review of previous research conducted prior to the initiation of these **Longitudinal Studies** established a foundation for the design and conduct of the studies included in the project. The most important conclusions from that review which impacted on the Longitudinal Studies are summarized below. First, the paucity of available empirical data--particularly from well designed studies--for many of the most important questions is disconcerting. Contrary to the conclusions of many previous reviewers and textbook authors, there simply was not enough information to be confident about the long-term impact of early intervention with handicapped children, and evidence in support of many of the commonly held positions about mediating variables (e.g., parental involvement, age at start) was either nonexistent or contradictory.

Second, there was strong support for the immediate positive effects of intervention with disadvantaged children and emerging support for long-term benefits. Furthermore, data were beginning to accumulate which support the immediate benefits of intervention for handicapped children. It was clear, however, that more research, particularly longitudinal research, was absolutely essential to guide both policy and practice.

Most relevant to the design of the **Longitudinal Studies** was the need identified from this analysis for higher-quality research. A number of other investigators had lamented the ambiguity caused by methodological flaws in early intervention efficacy research (Dunst & Rheingrover, 1981; Simeonsson et al., 1982). Fortunately, some of the most serious problems with previous studies were reasonably resolvable. First, in spite of the difficulties involved, and as discussed in more detail in a later section, the use of randomized designs in early intervention efficacy research is neither unethical nor impossible. Random assignment to groups is especially feasible and advantageous in those cases in which the number of families in need of services far exceeds the capacity of service agencies to provide comprehensive services or in those cases in which alternative treatment programs are being considered.

A second relatively simple procedure which could substantially improve the quality and credibility of past early intervention efficacy research would be the use of data collectors who are unaware of the group membership of subjects. Only 21% of the effect sizes included in our analyses of existing research came from studies in which the data collector was definitely "blind." Unfortunately, the educational and medical literature is rife with examples of ineffective or even harmful treatments that have been advocated by well-intentioned people who believed that their treatment was making a difference. We need not look far to see examples of people seeing what they expected to see, such as dietary treatment of hyperactivity, Doman Delacato therapy for learning-disabled children, or even blood letting in the not-too-distant past. The use of "blind" data collectors would eliminate this serious threat to the credibility of study results.

Another serious problem with previous research was that virtually all the early intervention efficacy research which existed at the time these **Longitudinal Studies** were initiated had failed to determine the extent to which the intended treatment was actually implemented. For example, in programs which intended to use parents as interveners, our analyses of previous research identified virtually no instances of evidence that parents actually did become involved to the degree intended by the program designer. Unless such information is obtained, there is a real danger that comparisons are being made between programs which were intended to be different, but were not. The failure to verify that intended treatments were actually implemented may have been responsible in part for the failure of previous research to detect differences among alternative intervention programs.

Finally, it was clear from these analyses that there was a need to pay more attention to making sure that there is symmetry between the outcomes assessed and the goals of the intervention. The specific nature of the intervention program should in large part dictate the outcome measures that are selected. Because resources for research are always limited, investigators should put first priority on measuring those outcomes which are most central to what their intervention is expected to accomplish. For example, some interventions have focused primarily on enhancing social and emotional functioning, but have limited their assessment to measurements of IQ. Because there is a substantial interrelationship among the multiple lines of development, differences in IQ may have been found. But these differences are probably much weaker than they would have been if measurements had been taken on those behaviors and competencies directly targeted by the intervention.

Our analysis of previous early intervention research clearly supported the need for more high-quality research on the issues outlined by the government for the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children** (i.e., intensity of intervention, age-at-start, and program variation, particularly parent involvement). The government's requirement that all of these studies be done using randomized experiments deserves further discussion in light of the very strong objectives to randomization raised by many early intervention professionals.

ETHICAL, PRACTICAL, AND SCIENTIFIC CONSIDERATIONS OF RANDOMIZED EXPERIMENTS IN EARLY CHILDHOOD SPECIAL EDUCATION

During the last 20 years, a variety of research methods have been used to determine whether some types of early intervention are more effective than others (e.g., Balow & Brill, 1975; Miller & Bizzell, 1983; Nelson & Evans, 1968; Strain, 1975). Recognizing that different research methods have merit, we argue here that one particular methodological technique--randomized experiments--has been underused in collecting data about the efficacy of various forms of early intervention. In doing that, we examine some of the most frequently used arguments for not using randomized experiments, and support the decision of the Federal government to require the use of randomized experiments in the **Longitudinal Studies**. The term "randomized experiments" will be used to refer to those studies which use a process of randomly assigning subjects to experimental groups (i.e., ensuring that every subject has an equal chance of being in any group). Such a procedure increases the probability that groups will be comparable on all variables that might affect the outcome except for group membership.

As an example of a randomized experiment, consider the case of the drug, propranolol, which was introduced in the early 1980s to prevent reoccurrence of heart attacks (Beta--Blocker Heart Attack Trial Research Group, 1982). To determine the efficacy of this particular drug, almost 4,000 patients who had previously suffered at least one heart attack were randomly assigned to one of two groups. One group received propranolol, the other did not. After an average of 25 months of treatment, the mortality rate from new heart attacks was 26% lower in the propranolol group than in the comparison group. Because the only systematic difference between the two groups was that one had received propranolol and one had not, the difference in mortality rate was attributed to the drug.

Obviously, the use of randomized experiments is not the only way to establish a cause and effect relationship (e.g., it is now well accepted that smoking is causally related to lung cancer even though randomized experiments have not been conducted), but it is one of the most efficient methods and has been used successfully in many areas of social science and health. Such research has demonstrated the ineffectiveness of many otherwise popular treatments (e.g., dietary treatments of hyperactivity, Spring & Sandoval, 1976; cell therapy for Down syndrome children, Pruess & Fewell, 1985; the use of laetrile in cancer therapy, Newell & Ellison, 1980; and Doman Delacato treatments for learning disabled children, Glass & Robbins, 1967). In many other cases, randomized experiments have established the benefits of a particular treatment (Mosteller, 1981)--even in cases where the value of the treatment was not particularly obvious (e.g., the effectiveness of fluoride in reducing the incidence of dental caries [Blayney & Hill, 1967]; or the fact that trained paraprofessionals can provide certain services as effectively as professionals [Durlak, 1979; Pezzino, 1984; Shortinghuis & Frohman, 1974]).

In spite of the historically demonstrated value of randomized experiments, many early childhood special education researchers, practitioners, and administrators have suggested that such designs are inappropriate for early intervention research (e.g., Bricker, Bailey, & Bruder, 1984; Dunst & Rheingrover, 1981; Odom & Fewell, 1983; Seitz, 1983; Simeonsson et al., 1982). The most frequently cited arguments can be summarized in three broad and somewhat overlapping categories.

The first argument suggests that randomized experiments are unnecessary because the information necessary to decide which types of programs are best for a particular group of children is more easily available from other sources. The second argument is that randomized experiments are impractical due to a wide variety of logistical, political, and technical difficulties. And, finally, it is argued that randomized experiments are unethical and probably illegal because the process of randomization requires that needy people be denied treatment or assigned to an undesirable treatment.

In what follows, we will argue that there are many instances in which each of these objections is incorrect, and that randomized experiments are valuable and should be more widely used. Although randomized experiments should not be the only method of investigating the efficacy of various forms of early intervention, the very infrequent use of randomized experiments in early childhood special education has been a serious impediment to the advancement of knowledge about the efficacy of early intervention.

ARE RANDOMIZED EXPERIMENTS NECESSARY?

Two related arguments are used to defend the position that randomized experiments are unnecessary. First, even though opponents agree that such experiments would provide good information about effectiveness, they argue that other methodological techniques are adequate and easier to implement. Second, it is argued that even though none of the existing data are perfect, the combined weight of so much evidence is sufficient for making decisions. These two arguments are discussed below.

There are other ways of knowing. Obviously, causal inferences can be made confidently in many instances without data from a randomized experiment: A particularly strong wind topples a tree, or an earthquake causes a building to crumble. Because there are no plausible alternative explanations, it would be foolish to argue with the validity of the causal inference. However, in comparing the relative effectiveness of particular types of early intervention, alternative explanations abound and serious mistakes are sometimes made.

Professional judgment or common sense is probably the most frequently used basis for arguing that a particular type of intervention is best for a specific group of children. It is primarily on this basis that people have argued that intervention should begin as early as possible, that parents are the key to effective intervention, and that more comprehensive or intensive programs result in greater benefits (Mastropieri, White, & Fecteau, 1986).

Fortunately, professional judgment is often correct and has led to significant advances. Occasionally, however, over-reliance on professional judgment leads to serious mistakes. One of the most dramatic examples comes from the late 1940s, when technological advances in incubators for low birthweight babies made it possible to systematically monitor the amount of oxygen provided to such infants. Because respiratory distress was the highest cause of morbidity and mortality among such infants, it was reasoned that increasing the concentration of oxygen would result in better outcomes. Encouraged by anecdotal reports and the compelling logic, hospitals across the country began the practice. Within a short time, incidence of retrolental fibroplasia (which leads to blindness) increased dramatically among such infants. Some suggested that the increased exposure to oxygen was responsible. However, this possibility was initially rejected because it was counter-intuitive that something as essential as oxygen--particularly in the presence of such high rates of respiratory distress--could be harmful. Eventually, randomized experiments were conducted and it was conclusively demonstrated that oxygen was the culprit (Gordon, 1954).

Such errors are not isolated occurrences. Gilbert, McPeck, and Mosteller (1977) examined all randomized experiments of major surgical and anesthetic innovations reported in INDEX MEDICUS between 1964 and 1973 (n = 36). Because of the life-threatening nature of the problems being treated, all of the innovations were supported by a great deal of professional judgment, anecdotal evidence, and correlational data prior to implementation of the randomized experiment. Nevertheless, the results of the randomized experiments indicated that more than half of the innovations were actually worse than the standard technique to which they were compared. Eleven percent were equally as good and thus provided an alternative approach that might be useful in specific circumstances, while only 33% were actually better. From these examples, it is clear that even though professional judgment is valuable, it should not be the sole means of deciding the relative merit of different treatments.

Correlational research is sometimes suggested as another alternative to randomized experiments, and many important causal relationships have been established on the basis of such research (e.g., the relationship between cholesterol and heart disease). However, before deciding that correlationship research is preferable to randomized experiments for a given issue, one should consider the tedious exclusion of alternative explanations required to make causal inferences from correlationship data. Unless such work is done, correlational research can lead to seriously inaccurate conclusions.

For example, a study of the correlation between amount of psychotherapy and measures of psychological well-being might conclude that psychotherapy is harmful because those patients who receive the most psychotherapy are least healthy. A more plausible explanation is that those people who only have minor problems progress relatively quickly and thus receive very little psychotherapy. Only the most severe cases receive extended therapy, and those cases are least likely to show dramatic progress. Similar examples abound. Sick people are most often found in hospitals, but not because hospitals cause sickness; and students who receive tutoring generally receive lower grades than untutored students, but not because the tutoring is detrimental.

The problems cited above with using correlational data are obvious, but in many cases, the problems are more subtle. For example, much of the support for the position that "earlier is better" in early intervention programs comes from correlational research (e.g., Bricker & Dow, 1980; Casto, 1978; Maisto & German, 1979). However, it may be that the association is due to other factors that covary with both progress and the age at which intervention begins. Such factors might include the fact that well-educated, highly motivated parents are more likely to identify problems and seek out intervention earlier; but they are also more likely to work with the child on their own and provide a more nurturing environment. Thus, additional progress might be made by such children as a result of the extra attention of more competent parents, rather than the earlier start in an intervention program.

Another alternative that is frequently proposed by those who believe that randomized experiments are unnecessary is some type of quasi-experimental design in which nonrandomized groups of children are compared. In the best of such studies, the researchers attempt to ensure that the groups are comparable on all variables except the variable being investigated, either through matching the groups on what are thought to be relevant variables or by some means of statistical adjustment. Although such matching and/or adjustment is theoretically possible, it is extremely difficult to do in practice. Campbell and Boruch (1975) noted that when using nonrandomized experiments one must make assumptions that are:

> Often untenable and even more frequently unverifiable. In addition, a melange of parameters must be identified and estimated based on insufficient theory and data. These two problems in themselves are sufficiently formidable...to justify eliminating them at the outset, by assuring through randomization that groups are identical to one another with respect to unknown parameters. (p. 208)

Problems with using nonrandomized experiments to draw conclusions about the effects of early intervention have been noted by Dunst and Rheingrover (1981) and Simeonsson et al. (1982). White, Mastropieri, and Casto (1984) gave more detailed examples in their analysis of the 21 early intervention projects approved by the Joint Dissemination Review Panel for national dissemination. White et al. (1984) concluded that even though such projects have made a substantial contribution to the field by demonstrating the feasibility of early intervention and by developing and disseminating curriculum materials and assessment instruments, one could conclude little about the efficacy of early intervention from these project reports due to the serious methodological weaknesses.

Some people have assumed that clever statistical manipulation could be used to make the same inferences from quasi-experiment designs as one might make on the basis of randomized data. The problems with such approaches have long been recognized and repeatedly discussed (Campbell & Boruch, 1975; Fisher, 1935; Smith, 1957; Wold, 1956), but the thought persists. The dangers of such an approach are nowhere more evident than in the Westinghouse evaluation of Head Start (Cicirelli, 1969), in which analysis of covariance was used to correct for nonrandom differences between the comparison groups. As Campbell and Erlebacher (1970) pointed out, the adjustments seriously underestimated the effect of Head Start and resulted in indefensible and incorrect conclusions.

We already know what works. A frequently advanced argument is that we already have sufficient data to demonstrate both the overall effectiveness of early intervention programs and the relative effectiveness of different types of programs. As stated in the foreword to a recent publication by the National Center for Clinical Infant Programs, "We've had the demonstration projects. Now how can we take what we've learned and get services to all disabled and at-risk children...starting at birth?" (NCCIP, n.d., p. 2, emphasis in original). Unfortunately, there is very little empirical support for this position. As already shown, the strategies used to collect much of the early intervention efficacy data for handicapped children suffer from methodological weaknesses; thus few conclusions can be drawn.

ARE RANDOMIZED EXPERIMENTS PRACTICAL?

A frequent argument against the use of randomized experiments is that even though they would provide useful information, administrators, service providers, and parents would never allow such experiments to be conducted in conjunction with early intervention service programs. The alleged opposition to randomization would occur because nobody would agree to participate in a study where they knew that some people would be denied services or that some would be receiving less effective services. Both logic and experience suggest that the difficulty of getting people to participate in randomized experiments may be more imagined than real.

At the present time, handicapped children are arbitrarily provided with varying dosages and types of early intervention based primarily on the biases of the administrator or what is popular and/or affordable in that particular area. Some handicapped preschool children receive home-based intervention, some receive center-based intervention, and some receive a combination of center- and home-based intervention. Some are given a highly structured teacher-directed curriculum, while others are given a more child-directed humanistic curriculum. Some children attend intervention for 5 days a week, others are visited as little as once a month. These variations are not completely explained by the type and severity of the handicap, the age of the child, or preferences of the parents. In other words, the type of intervention provided to children is constantly varied as a function of the experiences, biases, and resources of individual service providers.

The situation described above lends itself to the use of randomized experiments. Furthermore, the fact that there are not enough early intervention services to go around, coupled with the absence of certainty about what type of program is most effective, creates a situation in which randomized experiments are a feasible and appropriate way for deciding who gets what.

One of the easiest situations for randomized experiments is where there is not enough of the treatment for everybody to participate. Consider the Salk poliomyelitis vaccine trials, in which some children were given the vaccine while others were given an inert saline placebo. All children could not be given the vaccine because it was impossible to produce enough vaccine during the first year. To have made the allocation of vaccine on a first-come, first-serve basis would have discriminated against less well-educated families, because they would not have been aware of the availability of the vaccine. Thus, creation of randomized experimental and control groups was not only an example of an equitable allocation of a scarce resource, it also provided definitive information about efficacy of the vaccine.

Such examples are not limited to the medical field. In his application to the Joint Dissemination Review Panel for national validation, Hainsworth (n.d.) reported data for a project in which 23 moderately to severely handicapped preschoolers were available and met the established criteria for an intervention project. Unfortunately, the project only had enough resources to serve 12 of the 23 children. Instead of randomly assigning children to experimental and control groups, the project selected the 12 children with the most severe problems on a criterion-referenced instrument and provided services to those children. Because of problems with statistical regression, the results of the study are difficult to interpret (see White et al., 1984, p. 22).

The rationale for not conducting the randomized experiment was that the project was obligated to serve the most needy children first. However, since all of the children met the established criteria for receiving project services, it is unclear why a questionable measure of "need" should be used to decide who would receive services. Perhaps those children who scored highest on the test would have benefited more than children who scored lowest. Would not random assignment of children to groups be just as defensible as selection based on the criterion-referenced instrument? Furthermore, such assignment would have increased the probability of obtaining defensible information about the effectiveness of the project.

The practicability of randomized experiments is also supported by the fact that there are a number of examples of such experiments in early intervention research. In the comprehensive analyses of early intervention research referred to earlier, we identified over 80 randomized experiments. As shown in Table I.4, most of the studies have been done with disadvantaged children, and a higher percentage have compared one type of treatment to another type of treatment, as opposed to treatment versus no treatment comparisons. However, these data offer evidence that such studies are possible. In fact, some of those studies which have had the greatest impact on the field (e.g., the North Carolina Abecedarian Project [Ramey & Haskins, 1981]; and the Perry Preschool Project [Weikart et al., 1978]) were randomized experiments.

Table I.4

Number of Studies in Early Intervention Research Institute Meta-Analysis Data Set That Used Randomized Designs

	Disadvantaged	At-risk	Handicapped
Treatment vs. No Treatment	37 or 95 studies (38%)	4 of 10 studies (40%)	9 of 74 studies (12%)
Treatment A vs. Treatment B	25 of 58 studies (43%)	4 of 8 studies (50%)	14 of 47 studies (30%)

Note: Total data set includes information for 234 unique studies. Four studies reported information separately for two groups of children (e.g., handicapped and disadvantaged). Many studies reported information for both treatment versus no treatment, and A versus B comparisons; so the sum of the categories in each column will be more than the number of unique studies.

Program administrators often argue that parents will not agree to participate in randomized trials, but this may not be true in many cases. In four studies conducted at the Utah Early Intervention Research Institute (one treatment versus no-treatment study, and three comparisons of different types of treatment), acceptance rates by parents to the condition of random assignment ranged from 90% to 98% (Mehran & White, 1986; Peterson, Casto, & Lindauer, 1985; Pezzino & Lauritzen, 1986; Pezzino & Bradley, 1986). Similar figures have been reported by Ramey (1985) for his Abecedarian and CARE projects, and by Gross (1985) for the Infant Health and Development Project, all of which compare two levels of treatment. Such high acceptance rates suggest that it is practical to conduct randomized experiments.

ARE RANDOMIZED EXPERIMENTS LEGAL/ETHICAL?

Random assignment of children to treatment versus no-treatment groups or to comparative treatment groups would be unethical in those situations where there is proof that one treatment is superior and sufficient resources for that particular treatment are generally available in similar circumstances. As discussed below, neither of these conditions is met in most early intervention settings.

Knowledge about what works best. The most important condition is that unequivocal information is available about what works best. Many people rely on professional judgment for making such decisions. However, professional judgment is sometimes incorrect about what is best in a given circumstance. The example described earlier about high concentrations of oxygen for premature low birthweight babies is one of the most obvious examples, but it is not an isolated occurrence. Consider the following two examples; one from medicine, and one from early childhood education.

Gilbert, Light, and Mosteller (1975) described an experiment to determine if a major contributor to skyrocketing medical costs was the fact that insurers would only pay for work done in the hospital. It was hypothesized that inpatient services (which were relatively more expensive) were being used in instances where outpatient services would have been just as good, and that substantial savings would result if insurers would pay for outpatient services in cases where it could be appropriately substituted for inpatient services. An experiment was conducted in which 15,000 people were randomly assigned to a group in which the outpatient benefits were added on a trial basis, or to a group in which the regular program remained in effect. The results were completely contrary to expectations. Medical costs for the group with the added outpatient benefits rose by 16% while those for the group with regular benefits increased by only 3%. Both logic and professional judgment were incorrect.

There is also evidence in early childhood special education programs that we do not yet have all the answers about what types of programs are most effective. One specific example from among the many available is given here. In a study conducted in Great Britain (Sandow & Clarke, 1978; Sandow, Clarke, Cox, & Stewart, 1981), children were divided into matched groups in a quasi-experimental design in which the first group received a home-based intervention program with individual visits at 2-week intervals. The second group received a similar home-based intervention program but subjects were visited only once every 8 weeks, and the third group received no intervention. It was hypothesized that the more frequently visited group would make the greatest gains. Contrary to expectations, the group visited least frequently did the best.

Standards for what constitutes adequate intervention are generally based on intuition, collective wisdom, and/or clinical judgment, only some of which is correct. Consider the hypothetical situation in which half-day, center-based programs are provided to 3- to 5-year-old handicapped children, but there are not enough resources to serve all handicapped children in the catchment area. Consequently, services are provided to those who sign up first and others are put on a waiting list. Unfortunately, the position that a certain minimal level of services must be provided (in this case, 5 half-days each week) is seldom based on any sound empirical data. It may be that a 3-day-a-week intervention program or a home-based program in which visits are made to each family once a week would be just as effective. If the more limited program was just as effective, additional children could be served. Consequently, some children may be going without services because the service provider is insisting on meeting a "standard" for which there is insufficient evidence.

Availability of sufficient resources. When sufficient resources are not available to provide early intervention services to all children, programs are typically provided on either first-come, first-served, or to those children who are "most in need of help." Generally, once the available slots are filled, no further effort is made to identify children in need of services because it is argued that it would be unethical to identify the children and not provide them with services.

As an example of the problems with this type of an approach, consider a hypothetical situation in a state with virtually no publicly funded intervention programs for handicapped 0- to 3-year-olds. The state estimates that there are at least 600 children from 0- to 3-years old with established handicaps in a given county who are not receiving services. The state offers to provide enough money to develop and implement an early intervention program for 100 children. If it can be demonstrated that the program is effective, the budget will be expanded. From a historical perspective, we can predict what would happen. Most people would take the money, identify 100 children, collect pretest and posttest data, and on the basis of that data, argue that the program had been effective.

Not only is such an approach bad science, but it is no more ethical than to identify 200 children, randomly assign 100 to receive services, and use the other 100 as a control group. Arguing that such a design would deny services to the 100 children in the control group ignores the fact that those same children would have gone unserved using the first approach. In fact, by participating in the randomized experiment, control group children actually receive more services since they are regularly given developmental assessments. Serving subjects on a first-come, first-served basis also biases the acquisition of services towards those families who are better educated, more active in the community, and better informed. In fact, Campbell (1969) has argued that the random allocation of services is the most democratic and moral means of allocating scarce resources, since a first-come, first-served policy perpetuates social inequality.

The other argument used in allocating scarce resources is that those who are most in need should receive the resource first. This argument was used in the Hainsworth (n.d.) study referred to earlier, in which 23 children were identified as meeting the criteria for receiving services. The 12 children who were most severely handicapped were selected to receive the services. Such an approach ignores the fact that very little is known about what type of children benefit most from early intervention services. Perhaps with this particular program, severely handicapped children would make no progress. If that were true, it is difficult to argue that only the severely handicapped children should be served while the moderately handicapped children are left unserved. One way of determining which children profit most from services is to conduct randomized experiments. Unfortunately, very little such work has been done.

CONCLUSIONS ABOUT RANDOMIZED EXPERIMENTS

There is still much to learn about the relative benefits of different types of early childhood special education services for handicapped children. Because professional judgment and intuition are sometimes incorrect, it is crucial that we continue to collect data about such issues. Recognizing that many types of data will be useful, researchers and administrators should rely more frequently on the results of randomized experiments. Such experiments can take us beyond common sense knowing; not by replacing it, but by depending and building upon it. Conducting randomized experiments in early intervention is one of the most efficient and feasible ways of producing credible and replicable results, and the typical objections to such experiments are frequently without basis.

THE DESIGN OF THE LONGITUDINAL STUDIES

Based on the results of our analyses of previous early intervention research, and consistent with the requirements of the RFP, a series of longitudinal studies were designed to investigate the effects and costs of early intervention with handicapped children. This section summarizes the design and organization of those studies.

The longitudinal studies conducted by EIRI were designed to: (a) increase the knowledge base concerning the efficacy of early intervention with handicapped children in order to improve current service programs, (b) provide information about the costs of various alternative interventions, and (c) demonstrate the feasibility and utility of conducting experimental longitudinal research in collaboration with typical service providers.

Theoretical/Conceptual Framework

The questions to be addressed, the specific research projects to be conducted, and the outcome measures selected have been developed in accordance with what is

Nebraska, California, Arizona, New Mexico, and Colorado). Advisory board members and field reviewers were also sent letters requesting that they contact us about any potentially interested programs. Thus, information about EIRI's desire to talk with sites interested in collaboration was widely disseminated.

Each site contacted was provided with a description of EIRI and apprised of the criteria for inclusion as one of the 16 longitudinal studies. These criteria included:

1. ability to randomly assign subjects;
2. relevant treatment differences;
3. sufficient number of children;
4. willingness to provide access to cost information;
5. ability to participate in child assessments on a longitudinal basis;
6. staff interest in the project; and
7. ability to fund any expanded services that were necessary for the comparison.

Discussions were held with representatives of over 70 potential sites in order to include the 17 for which results are described in this report. Many of the programs contacted were not able to meet all of the above criteria. For some programs, current services were either very comprehensive, or the funding necessary to implement an expanded services program was not available. Other programs had sufficient funding, but did not have an adequate number of children for a large longitudinal study; other programs found that random assignment would not be feasible or desirable for their population. Those programs which looked promising were visited by an EIRI staff member. Site visits provided staff with the opportunity to see the programs in action and to talk with program staff. Information which was difficult to obtain over the phone thus became available as the result of these visits. Thirty-seven sites were visited in order to secure cooperation from the 17 sites eventually included.

As a result of these site visits, programs were selected for consideration as one of the longitudinal studies. The studies eventually included and represented a wide range of populations and comparisons, all of which are consistent with the requirements of the RFP. The selection of sites was necessarily restricted by the requirements of the RFP and the inability to provide funding for the services necessary to the experimental services being proposed. For example, many more sites could have been identified to conduct age-at-start studies if funding would have been available through the contract to begin serving some of the very young children in a state where such children were currently not receiving services. In other cases, interested programs were serving too few children, or were unwilling to meet the criteria for random assignment.

CRITERIA FOR SELECTING SITES

During the visits to programs as well as during telephone contacts, information was gathered about a number of factors relevant to conducting a research study at the site.

Random assignment. A frequently encountered objection to a possible collaborative relationship was the program's willingness to randomly assign children to alternative intervention programs. In some cases, it was due to the facts that programs were mandated to serve all children who were identified and that the level of service was already comprehensive. In other cases, program staff had difficulty with the concept of random assignment and so were not interested in participating for this reason. Thus, random assignment was a relevant criterion for initial interest and collaboration.

Treatment differences. Many programs which were contacted by the Institute had specific ideas for research to be conducted. However, in some cases, the differences between the proposed alternative interventions were relatively minimal. Whenever possible, EIRI staff discussed the possibility of substantially increasing the differences between treatment groups. For example, in the SMA/Lake McHenry

Program, the original proposal was to compare once-per-week services to twice-per-week services. However, EIRI staff felt that this difference between the groups would not be sufficient to justify conducting the research. Thus, EIRI staff worked with the SMA/Lake McHenry Program to develop a research design in which treatment differences were increased to once-per-week services versus three-times-per-week services. In cases where programs could not realistically provide a greater difference between the treatment groups, they were placed as a lower priority for inclusion.

Appropriateness of treatment. EIRI staff reviewed each program using a checklist to determine if the treatment currently being provided, as well as the added services to be provided, were generally consistent with "best practices." The checklist used was based on the materials used by the Technical Assistance and Development System (TADS) for conducting needs assessments with HCEEP programs. Only programs which showed evidence that the treatment being provided was well accepted for the population being served were considered for inclusion in the **Longitudinal Studies**. A decision about appropriateness, however, did not relate to the specific theoretical orientation of the program. That is, regardless of the particular theoretical approach to treatment implementation, programs which provided support for the suitability of a particular approach were seen as acceptable.

Cost comparisons. A primary goal of this research was to examine not only the effects, but also the costs of any particular program being implemented. Therefore, it was necessary to evaluate each project on the basis of the difference in costs for the alternative programs. In many cases, an interesting comparison may not reveal substantial difference in costs: in some cases, a comparison was included even though there were not substantial cost differences. However, other things being equal, every effort was made to select programs in which cost comparisons were maximized.

Ability to participate in longitudinal research. Due to the longitudinal nature of the studies to be conducted, the ability of programs to provide access to child data after the child left the program was explored. In most cases, unless the child was to continue to be served by the same service program, specific procedures were not in place to follow children after leaving the early intervention program. Thus this criteria primarily provided a way of identifying the programs in which this would be facilitated versus those in which extensive efforts would be necessary to track children after leaving the program.

Population characteristics. The populations of the studies were selected to be consistent with the requirements of the RFP. Within a particular study, however, an attempt was made to maximize the homogeneity of the population to the greatest extent possible. Thus, it was necessary to review each program for the type of children being served, including disability, severity of disability, and age, as well as the number of children available. When it was not possible to have a homogeneous group for one characteristic, for example disability type, it was seen as necessary to maximize the homogeneity of other characteristics such as the age range of the subjects or their severity of disability.

Liaison strength. For each of the potential studies, the strength of the personnel at the site was assessed. This involved the research background of the staff, their familiarity with service provision, their understanding and knowledge of assessment, and, most importantly, their willingness and ability to work with EIRI staff. The criteria for liaison strength was primarily influenced by this last characteristic. Also, programs in which staff did have research backgrounds were seen as being more appropriate than those in which staff did not.

Funding configuration. Due to the prohibition against using project funds to support the provision of intervention services, it was necessary to identify programs which could provide or obtain the funding for additional services. While in many cases obtaining additional funding through grant proposals was a possibility, there was always an element of uncertainty in this approach. Thus, sites in which service money was already available for providing added services were rated more highly than those in which grant money would have to be applied for later.

Costs/difficulty to implement. A number of logistical issues about actually implementing the research were considered for each potential site. While this could not be the primary criterion for site selection, it was an important part of the final decision. These practical aspects included both the difficulty of implementing the research as well as the difficulty the agency might have in implementing additional services necessary for the research. It was also necessary to consider the amount of EIRI staff time necessary for implementing the project, the cost of travel to the site, the need for training site personnel, the feasibility and ease of verifying treatment implementation, the predicted subject mortality, and the number of service providers which would be involved in the particular study.

With regard to a service perspective, the availability of site personnel, the potential integrity of the limited treatment group to access services, and the support from site administrators was evaluated. Administrative support was seen as being an essential component for inclusion in the **Longitudinal Studies**.

Based on the criteria referred to above, 16 sites were initiated in the Fall of 1986. As noted in the previous section, there were some adjustments over the course of the first five years of the study as some projects dropped out or were eliminated and others were added. The 17 studies reported in this volume are those for which enough outcome data were collected to be considered as a part of the completion of the contract with the federal government.

Common Elements of Each Study

Even though the studies were being done in geographically diverse sites with varied populations and intervention approaches, each project adhered to the following design features to ensure the integrity of the research and the credibility of conclusions.

RANDOM ASSIGNMENT TO GROUPS

As noted previously in this report, many early childhood special educators have questioned the feasibility and/or ethics of randomized experiments. However, as was argued earlier in this report, properly designed studies are neither infeasible nor unethical. Furthermore, even though randomization does not guarantee a "good" study, it is one of the best methods for reducing the probability of many of the most obvious alternative explanations for observed effects.

Each of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children** compared two alternative forms of early intervention by randomly assigning children who met pre-specified criteria to one of the two groups. In each study, parents' informed consent to participate in the study was obtained prior to random assignment. Random assignment was done by researchers at EIRI so that:

- Each child had an equal chance of being assigned to any of the groups within that study.
- Service providers or parents could not influence the decision about the group to which a particular child was assigned.

In each study, stratification techniques were used prior to randomization in order to increase the statistical power of the design and to reduce the probability of random fluctuation resulting in large pre-treatment differences between the groups on the variables most relevant to the outcomes being measured.

Specific procedures for random assignment varied from project to project, depending on whether:

- All of the subjects in a particular cohort (at least 20 subjects) were available for group assignment at the same time; or

- Subjects became available for assignment to one of the alternative treatment conditions as they were identified over an extended period of time (usually less than 5 subjects per month).

Procedures for each of these two categories (one-time assignment versus ongoing assignment) are described below.

Studies with one-time assignment. Any study which had at least 30 children who could be assigned to alternative treatment groups at one time was included in this category. Those studies included:

a. Jordan Intensity
b. Arkansas Intensity
c. New Orleans ARC
d. Des Moines
e. Utah Parent Involvement '85
f. Utah Parent Involvement '86
g. New York Association for Children with Down Syndrome
h. Arkansas Hearing Impaired
i. PITCH

In each of these studies, the available population was stratified on two variables which seemed particularly relevant to the outcome of the study. For example, in the Des Moines study, children were stratified by teacher ratings of high vs. low parent motivation as the one factor, and chronological age in months (27 to 42 vs. 43 to 54 vs. over 54) as the other factor. A maximum of six cells was created by the two variables selected for stratification (in other words, it was always a 2 x 2 or 2 x 3 stratification).

The specific variables used for stratification in each of the studies are described later in this report. Within each cell of the stratification, available children were rank ordered on a variable such as chronological age in months or pretest scores on a measure of child functioning. The children within each cell were then randomly assigned to one of the groups by taking the first pair of children in the rank ordering and flipping a coin to determine whether the first child should be assigned to Group A or B. The remaining child in that pair was assigned to the opposite group. Additional children within the same cell were then alternately assigned to one of the two groups in the same way. When all children in the first cell were assigned, children in the second cell were considered. Using the same procedure, a coin was again flipped for the first pair, which determined the order of assignment for every other pair within the cell. This procedure was continued for every cell.

Studies with ongoing assignment. A number of the studies enrolled children in the intervention program over an extended period of time as new children were identified. These studies included:

a. New Orleans IVH
b. New Orleans Visually Impaired
c. SMA/Lake-McHenry
d. Belleville
e. Salt Lake City IVH
f. Wabash and Ohio
g. South Carolina IVH
h. Columbus

In each of these studies, two variables were selected which were thought to be correlated with anticipated outcomes. For each study, the identified variables were used to create a 2 x 2 or 3 x 3 matrix (i.e., either 4 or six cells, respectively). As subjects were identified, it was noted where they fit with respect to the cells of this matrix. For subjects in each cell of a two-group comparison, there were four possible sequences of assignment where "A" indicated one of the two groups and "B" indicated the other group.

Sequence #1 = ABAB
Sequence #2 = BABA
Sequence #3 = ABBA
Sequence #4 = BAAB

For subjects in each cell of a three-group comparison, there were six possible sequences of assignment, where "A" indicated one of the three groups, "B" indicated a second, and "C" indicated the third.

Sequence #1 = ABCABC
Sequence #2 = BACBAC
Sequence #3 = CBACBA
Sequence #4 = CABCAB
Sequence #5 = BACBAC
Sequence #6 = ACBACB

When the child was identified for assignment to groups, it was determined whether the child was the first child to be enrolled in the project from that cell. If so, a die was cast (with either four or six numbers, depending on whether it was a two-group or a three-group comparison, respectively) to determine the assignment sequence to be used for the first group of children in that cell. For the next group of four (or six) children identified as belonging to that cell, the die was cast again to determine the sequence for that group of children. This process was repeated for each cell of the matrix as the first child in that cell was identified.

IMPARTIAL DATA COLLECTION

It is well documented in the social sciences that people tend to see what they expect to see (e.g., Foster, Ysseldyke, & Reese, 1975; Rosenthal, 1976). A major problem with past early intervention efficacy research was the tendency to use data collectors who not only knew which children were receiving the experimental treatment, but also had a vested interest in the outcome. In the meta-analysis reported by White and Casto (1985), only 21% of the effect sizes came from studies utilizing "blind" data collectors. The failure to use impartial data collectors is a major design flaw, especially in light of a substantial body of research (e.g., Gould, 1983) which suggests that expectations, even when they are subconscious, can be a powerful influence on how data are collected and interpreted. All of the studies conducted by this project used data collectors who were uninformed or unaware of the purpose of the experiment and the group membership of the subjects. This relatively simple procedure eliminated an important threat to the internal validity of the research studies to be conducted.

ASSESSING THE IMPACT OF EARLY INTERVENTION ON BROAD MEASURES OF CHILD AND FAMILY FUNCTIONING

Some of the most difficult issues to satisfactorily resolve in conducting longitudinal research on the effects and costs of early intervention with handicapped children are the questions surrounding instrumentation: What data to collect? When to collect those data? How to ensure that the data are collected satisfactorily? However, the way in which the studies are designed and the selection of the specific studies to be conducted are also important; these issues have well-developed and widely-agreed-upon strategies, techniques, and conceptual frameworks which can guide decisions. In the area of instrumentation for early childhood special education, however, the one thing which is abundantly clear is that the state-of-the-art in terms of assessing child change attributable to intervention is inadequately developed, and totally satisfactory instruments are not available. With regard to measuring the impact of early intervention on families, the field is even less well developed.

In recent years, there has been a growing awareness that efforts to evaluate the efficacy of early intervention programs have often been too narrowly focused (Ramey et al., 1982; Simeonsson et al., 1982; Zigler & Balla, 1982). As indicated by our previous review of the literature, past early intervention efficacy research has been too focused on easily available, psychometrically sound instruments such as measures of IQ, and has largely ignored other areas of child functioning such as social-emotional growth and adaptive behavior, as well as indicators of family functioning.

Because resources for evaluation are always limited, it was impossible to collect all of the data that might have been of interest. However, it was crucial to pay more attention to areas such as social-emotional growth and family functioning. The studies conducted as part of this project selected measures based on two sources of information: (1) what would be predicted by the theoretical/conceptual framework underlying the **Longitudinal Studies** and the particular intervention program, and (2) which areas have other investigators identified as important with similar types of interventions.

Information such as IQ, motor functioning, and language functioning were, of course, collected. However, additional information such as mother and child interaction, parental attitudes toward their child with a disability, child success in school as indicated by special education class placement and grade retention, and perceived stress as reported by the parents was also collected. In each case, the specific goals and activities of the intervention program was the primary source of information in selecting assessment instruments.

A limited number of instruments were used across all projects. For example, the Battelle Developmental Inventory, the Parenting Stress Index, the Family Adaptability and Cohesion Evaluation Scales, the Family Resource Scale, the Family Index of Life Events and Changes, and the Family Support Scale were used in all projects (see Mott el al., 1986, for a discussion of why these measures were selected). Other parts of the assessment battery, however, were individually tailored to the particular population being served and the type of intervention program implemented in each of the research sites.

EIRI staff engaged in a number of activities throughout the course of the project to identify the most appropriate measures to use in the studies. These activities included literature reviews, solicitation of input from experts in the field of early childhood assessment, and collection of data on promising instruments.

Pretesting

Pretests were conducted at each site using the Battelle Developmental Inventory (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984), Parenting Stress Index (Abidin, 1986), Family Resource Scale (Dunst & Leet, 1985), Family Support Scale (Dunst, Jenkins, & Trivette, 1984), Family Adaptability and Cohesion Evaluation Scales (FACES III) (Olson, Portner, & Lavee, 1985), and Family Inventory of Life Events and Changes

(FILE) (McCubbin, Patterson, & Wilson, 1983). Each of these measures was selected to assess a different aspect of child and/or family functioning as follows:

> ***Battelle Developmental Inventory (BDI)***. The BDI is a standardized, individually administered assessment battery of key developmental skills in the following areas: Personal/Social, Adaptive, Motor (Fine and Gross), Communication (Expressive and Receptive), and Cognitive abilities. This measure was selected as a core child outcome measure due to the broad span of abilities tapped, a wide age range (birth through age 8), adaptations for handicapped children, and good psychometric characteristics.
>
> ***Parenting Stress Index (PSI)***. The PSI was used to measure parental reports of stress in the parent-child system. Child-related factors include Adaptability, Acceptability, Demandingness, Mood, Distractibility/Hyperactivity, and Reinforces parent. Factors related to others include Depression, Attachment, Restriction of Role, Sense of Competence, Social Isolation, Relationship to Spouse, and Parent Health.
>
> ***Family Resource Scale (FRS)***. This scale was used to measure the extent to which different types of resources are adequate in households with young children. Factors include General Resources, Time Availability, Physical Resources, and External Support.
>
> ***Family Support Scale (FSS)***. This scale was used to assess the availability of sources of support, as well as the degree to which different sources of support have been helpful to families rearing young children.
>
> ***Family Adaptation and Cohesion Evaluation Scales (FACES III)***. This scale was used to provide a general picture of family functioning by assessing the family's level of adaptability and cohesion. The scale also has a perceived as well as an ideal form which provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
>
> ***Family Inventory of Life Events and Changes (FILE)***. This scale was used to assess life events and changes experienced by a family unit during the past 12 months. The specific areas of potential strain covered by the scale include: Intra-family, Marital, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.

Measures administration. The BDI administration time ranged, depending upon the age of the child, from one to two hours. The full battery of family measures, including collection of demographic data, required between one and two hours for parents who read at the fifth grade level or higher. Parents who had poor reading skills, or those with special characteristics (e.g., mental retardation), required more time because the measures were administered in an interview format. Less than

5% of the parents required an interview format for the administration of the family measures.

In general, families were cooperative in completing the pretest battery, which is quite positive given the fact that for some parents it required as long as four hours. Diagnosticians, assessment supervisors, and program staff who observed the assessment process attributed much of this positive response to the availability of a nominal monetary incentive for parents.

The use of the BDI was more difficult than expected, due to the need to train diagnosticians on this newly developed test. In using the BDI, it was also discovered that the DQ scores which can be derived from the tables in the manual for children scoring below 65 were quite misleading--often resulting in DQs in the negative range. Consequently, any measures of DQ reported in this volume are based on scores computed using the ratio of Age Equivalents to Chronological Age.

Management of pretesting. The management of pretest data collection was accomplished through the use of assessment supervisors and diagnosticians hired at each site. The responsibilities of the assessment coordinators included:

1. Familiarization with administration of the BDI.
2. Training and monitoring of diagnosticians.
3. Scheduling of testing.
4. Checking of data and transmitting completed protocols to the EIRI site coordinator.
5. Reporting of test results to parents who requested them.

Diagnosticians at each site were responsible for administration of the BDI and the family measures. Formal procedures for training, certifying, and monitoring the work of diagnosticians was done to ensure high-quality results.

Recruitment, Training, and Monitoring of Diagnosticians

Given the widely scattered geographic location of participating sites, procedures were needed for recruitment, training, and monitoring of diagnosticians in order to ensure the quality of outcome data. Without such procedures, it is possible that data of questionable validity could have been collected--thus jeopardizing all of the work of the longitudinal research. The following sections outline the procedures for recruiting, training, and monitoring the diagnosticians who administered the outcome measures.

The assessment supervisor hired at each site was instrumental in identifying candidates for diagnostician positions. Diagnosticians were recruited who had at least a bachelor's degree and some work towards a Masters, with course work and experience in individualized testing. Professionals with additional experience in working with children with disabilities and/or children under five years of age received primary consideration.

Training. Training of the diagnosticians and the assessment supervisors was divided into three subsections: individualized pretraining, group training, and certification of performance. Individualized pretraining materials were mailed to the assessment supervisor approximately one month prior to the EIRI-conducted group training session. Each participant was required to study the Battelle Examiner's manual and review the separate domain manuals. An introductory videotape depicting an overview of the purposes, organization, and administration techniques for the Battelle was also provided. Subsequent videotapes provided detailed information regarding preparation procedures for test administration and the administration of the Personal/Social Domain. Actual administration of items from the Battelle was depicted on the videotape, including examples of scoring for selected items.

After viewing the videotapes, written exercises were completed by the trainee. Due to the complexity of the scoring procedures for the BDI, pretraining activities were designed to provide the trainees with an opportunity to become acquainted with the process. A detailed handout clarified the scoring procedures and specific rules to be followed for EIRI research. A completed sample scoring booklet was provided, demonstrating the calculation of raw scores, age equivalents, and standard scores.

The trainees were then directed to complete two of the five versions of the practice scoring booklets, calculating subdomain and domain raw scores as well as standard scores and age equivalents. Finally, a self-administered test was given so that the trainee could assess the degree to which he/she had mastered standardized administration and scoring procedures, test organization, and test content. Trainees were encouraged to do further study prior to the group training in areas where they did not do well. The assessment supervisor at each site was responsible for making sure that trainees completed all of the training materials before participating in the group training. The assessment supervisor also completed the pretraining activities if he/she had not done so at a previous time.

Group training was conducted by an EIRI staff member in 1½ days at the research site. Given the need to ensure accuracy in testing, a great deal of modeling, simulated practice, and immediate feedback on performance was deemed necessary for the training to be successful. Therefore, the focus was on intensive, personalized training instead of using instructional videotapes. All diagnostician candidates and the assessment supervisors were required to attend the group training session.

The group training session began with a brief overview of the Battelle Developmental Inventory, including the rationale for selecting it as the core measure of child functioning, the importance of adhering to standard procedures, and concurrent validity findings. More sophisticated scoring procedures were reviewed, such as the use of extreme scores. Common mistakes and suggestions for preventing scoring errors were provided. The majority of the training session focused on the five domains of the Battelle. Domain-specific administration procedures were emphasized by the trainer. Guided practice of actual item administration was done by dividing the participants into pairs. After practicing selected items, a group demonstration and feedback on performance was given. The trainees were also asked to determine item scores based on the observed performance. Finally, adaptations for various disabilities were discussed.

Following this practice, a 40-minute videotape portrayed the administration of certain items. The purpose of this exercise was to evaluate the trainee's ability to discriminate correct from incorrect administration and scoring procedures. During this administration, the diagnostician on the videotape did most things correctly, but committed a number of mistakes ranging in seriousness from minor to very major. A completed protocol accompanied this videotape, and trainees were asked to identify mistakes in administration or scoring made during the administration.

A group administered mastery paper and pencil test was administered at the conclusion of the Battelle training. This was a "closed book" test, containing items that required the trainees to recall pertinent factual information as well as apply the learned information. Ninety percent accuracy was required on this test before the trainee could be certified as an EIRI diagnostician.

In most cases, the diagnosticians who attended the Battelle testing session also administered the family measures. Though the diagnosticians did not score the measures or study the parent's responses, they needed to be familiar with the surveys in order to check the forms for completion and answer any questions that the parents had. Therefore, an overview of the administration procedures for the family measures was also provided at the group training session.

Following the group training session, each trainee completed three BDI practice administrations. At least one of the three practice tests had to be administered to a child with a handicapping condition/developmental delay similar to those of subjects in the study with whom the diagnostician was working. The first administration was done independently, and the completed protocol given to the assessment supervisor. Each trainee was then observed by the assessment supervisor, administering either a second full BDI or selected items appropriate for the child's developmental level. The assessment supervisor evaluated the trainee's adherence to standard administration procedures and scoring rules. Constructive feedback concerning the trainee's errors was given and strengths that the trainee demonstrates were reinforced. Eighty to 100% accuracy was required before the trainee could be certified as an EIRI tester. This demonstration had to be repeated if the criterion was not met. The third performance exercise required that the trainee be videotaped during the administration of a complete Battelle. This videotaped administration, accompanied by the corresponding protocol, was sent to the EIRI assessment coordinator and was shadow scored, and interreliability was calculated. Agreement for scoring had to be equal to at least 80% in order for the trainee to be certified as an EIRI diagnostician. Administration errors had to be minimal. Trainees who successfully completed the training process also had to sign a promise of confidentiality prior to testing for EIRI.

Monitoring. To maintain accuracy in test administration, the diagnosticians were monitored closely by the assessment supervisor. Ten percent of each diagnostician's Battelle administrations were observed and shadow scored by the assessment supervisor or fellow diagnosticians and had to result in at least 80% agreement and accuracy. Agreement between the EIRI assessment coordinator and the diagnosticians on these videotapes ranged from 80% to 96%, with a mean of 89%. Diagnosticians who tested for a research site for several years had to submit a videotape of an administration to the EIRI assessment coordinator yearly, demonstrating that the tester was not drifting from standard administration procedures.

Posttesting

The core assessment battery administered at pretest was administered again at posttest. In addition, an average of three complementary measures were administered in each project. The complementary measures were selected to reflect specific differences expected in particular questions under investigation. An attempt was also made to administer the same complementary measures in studies which deal with similar populations of children. For example, an effort was made to use similar measures in each of the three studies of children with IVH.

The specific complementary measures used in each study are described more fully in the reports of the individual studies later in this volume. A number of the instruments or procedures used as complementary measures were developed by EIRI institute staff in areas where existing measures were inadequate. For example, there is no existing instrument for assessing the motor functioning of young children which will provide a detailed assessment of motor functioning in children from birth to age three. Existing instruments are either too narrow in age range, have poor psychometric properties, or require a great deal of clinical judgment of trained physical therapists to administer. Two such instruments require some explanation.

Videotaped assessment of motor functioning. Due to the emphasis on motor development with subjects involved in the IVH studies, assessment procedures that were sensitive to changes in motor behavior were needed. Standardized instruments such as the Peabody Motor Scales provide normative information based on the achievement of developmental motor milestones. However, physical and occupational therapists focus intervention on enhancing patterns of movement which are the components of these milestones. Although attempts have been made to develop standardized measures of early movement patterns, no tool was available at the time these studies were being conducted. To address this need, a videotaped sequence of movement patterns was developed. The standardized sequence is designed to analyze motor behaviors seen in children functioning up to a 12- to 15-month level.

At 12 months adjusted age, all subjects involved in the IVH research studies were videotaped completing this sequence. Scoring procedures to analyze treatment differences between the early versus late groups as well as to determine individual subject changes were developed by EIRI staff. Motor therapists with experience in neurodevelopmental treatment who were naive to the research design scored the videotapes.

Videotaped assessment of parent-child interaction. Awareness of the importance of parent-child interaction had substantial influence on assessment and intervention practices at the time these studies were initiated. A number of EIRI studies that had a major parental involvement component in their treatment groups were involved in assessing parent-child interaction. In order to evaluate the effects of the parent involvement treatment, a standardized procedure for videotaping was developed which was based on a specific sequence of structured and free play activities with a fixed set of materials. Researchers who had developed validated coding systems were hired as consultants to analyze the videotaped interactions (these included Gerald Mahoney, Kofi Marfo, and Dale Farran). There were several benefits in using a variety of coding systems in this manner. The primary purpose was to assess a greater variety of effects due to the intervention. Differences in maternal and child linguistic speech/communication patterns, and maternal behavior (i.e., directiveness, responsiveness, encouragement, method of control) are all factors that could be studied only by using several different approaches. By comparing several systems to each other, it was hoped that information would result that would assist practitioners in selecting a system best suited to their needs and their population. In addition, valuable concurrent validity information resulted from using the various systems.

Management of posttesting. The collection of posttest data was also accomplished by on-site assessment supervisors and diagnosticians. Additional time was required during posttesting in order to accommodate the large number of measures. Most posttest sessions required at least two, two-hour sessions for complete data collection. Parents were paid an additional incentive for participating in more than one posttest session.

PROCEDURES TO VERIFY THAT THE INTENDED TREATMENT WAS ACTUALLY IMPLEMENTED

Most reports of the past early intervention efficacy research have failed to explain whether procedures were used to determine the extent to which the intended treatment was actually implemented and how it was experienced by participants. For example, for programs which intended to use parents as intervenors in their child's program, very few report whether parents became involved to the degree intended by the program designer, whether they understood what was expected of them, or whether they carried out the intervention consistently and appropriately. Unless such information is obtained, there is a real danger that comparisons will be made between programs that were intended to be different but that in fact were not. The failure to verify that intended treatments were actually implemented may be partly responsible for the lack of significant findings in those early intervention studies which compared high and low levels of parental involvement (Casto & Lewis, 1984).

To address the problems of interpretation and the resulting ambiguities when there is little or no evidence regarding the fidelity of treatment procedures, each of the **Longitudinal Studies** used both self-evaluation procedures and external monitoring to document the degree to which intended treatments were actually implemented. These procedures were tailored to the individual studies but generally involved site visits by staff members external to that particular project who used checklists, questionnaires, and rating forms to document the delivery of services. Additional information was collected using attendance data, teacher logs, parent questionnaires, and telephone monitoring.

Treatment verification procedures serve four purposes in the longitudinal research:

1. Independent and empirical confirmation that treatment was implemented as intended, and, where departures from the original plan occurred, technical assistance was provided;
2. The nature of data collection for the treatment verification process serves as a stimulus for self-improvement and consistent implementation;

3. A comprehensive description of research conditions allowed better understanding and generalizability of results; and

4. Data collected were used to document which subjects participated more extensively so that this could be accounted for in the data analysis.

Rationale for the Verification Process

A major failing of many educational evaluations is that little or no attempt is made to describe and measure the services provided (Casto & Mastropieri, 1986; Evans & Behrman, 1977; Hall & Loucks, 1977; Rosenshine, 1970; Shaver, 1979). Often, researchers seem to regard experimental treatments as constants that are always implemented exactly as intended and do not vary from classroom to classroom or program to program. In studies of varied treatments, neglecting to determine degree of implementation can lead to erroneous conclusions (Cooke & Poole, 1982).

These erroneous conclusions often have serious consequences for policy decisions. For example, in the Westinghouse study of Head Start (Westinghouse Learning Corporation, 1969), the lack of any information about which classroom practices were employed and how the variation in these practices affected outcome severely hampered the validity of the conclusions. Nevertheless, the results of this study, which showed no effect of intervention, nearly led to the discontinuation of the Head Start program by Congress. In a similar quasi-experimental evaluation, the Abt Follow Through study (Stebbins, St. Pierre, Proper, Anderson, & Cervaj, 1977), the only non-controversial finding was that the variation within models exceeded the variation among models (House, Glass, McLean, & Walker, 1978). This finding, in itself, is justification for including information on implementation so that results like this can be better explained. Indeed, in a complementary study, the Stanford Research Institute did measure the degree to which the various models were implemented and provided a more complete and fair evaluation than would have been possible without such data (Stallings, 1975).

A statewide study of compensatory preschool in South Carolina, conducted by the Early Intervention Research Institute (Barnett, Frede, Mobasher, & Mohr, 1988), illustrates how information on treatment implementation can completely alter the conclusions of a study. In this study, children in 14 classrooms were compared to a waiting list control group to determine the effects of a compensatory preschool program. The original analysis, which included all of the classrooms in the study, found no statistically significant preschool effect. However, when the treatment implementation data were analyzed, it was discovered that the two classrooms that had not implemented the program at even a minimal level were also the two classrooms that had a negative effect on the posttest score of the preschool group in comparison to the control group. The abnormally low implementation score of these two classrooms justified excluding them from the second analysis, which resulted in a significant preschool effect. Without data on treatment implementation, the conclusion would have been drawn that the program was not effective, but the "program" would have inappropriately included classrooms that did not implement treatment to even a minimal degree.

In another study conducted by EIRI (Mehran & White, 1988), treatment verification data were gathered to determine the degree to which individual parents participated in a home-based parent tutoring program designed to enhance the reading skills of Chapter I-eligible kindergarten-aged children. It was found that when all children from this randomized experimental/control group study were included in the analysis, there were immediate but no long-term effects. When the analyses were limited to include only those children for whom the program had been implemented well, there were also substantial and statistically significant long-term benefits. The conclusion that the program was effective, but only for those that participated fully, would have been missed if it had not been for the treatment verification data.

Procedures

In the treatment verification procedures for the **Longitudinal Studies**, EIRI staff used multiple data sources to cross validate treatment implementation data sources. These triangulation procedures (Denzin, 1978; Mercer, 1979) required that data from one source be verified or confirmed by data from other sources. In the case of treatment implementation, self-report data collected from intervention personnel were compared to data collected through direct observation and records. Data were collected on three entities:

- The Child
- The Family
- The Program

A core set of treatment verification instruments were used across all of the sites, while a number of other site-specific measures were used in certain sites. For example, in the Arkansas Hearing Impaired study, where the effects of a total communication approach were compared to an oral communication approach with young hearing-impaired children, the opinions of the teachers on the effectiveness of the contrasting approaches were collected through a questionnaire, and information was collected from parents about which communication mode was most frequently used with the child at home. At the New Orleans ARC site, which contrasted basic group educational activities with individualized programming, periodic videotaping of treatment implementation and direct observation using ecobehavioral techniques were used to ensure that the alternative interventions occurred as expected.

Data on the Child

Data on individual children were collected in the treatment verification process in order to provide more specific information on each child to help explain variations in the efficacy of treatment on different children, to document how treatment varied from child to child, and to ensure that individual children received the treatment as it was intended, and, if not, to ameliorate the problem when possible.

Individual Education Plans were examined at each site as a partial measure of program quality and to provide more detailed information about the child and his/her needs which could later be helpful in analyzing data. For example, in one study, a child from the experimental group scored abnormally low on the posttest. On checking her IEP, it was discovered that a major objective for this child was to encourage her to talk with people other than her family. On further investigation, it was determined that she was severely withdrawn and did not respond well to the posttest situation, even though she had begun to behave normally in class. The IEP provided valuable information that guided the search for an explanation of her outlying posttest score.

The *Log of Individual Services Provided* was kept monthly by all intervenors--therapists, teachers, and home visitors, and was augmented with the monthly *Child Attendance Records*. Child attendance was used as one variable in the data analysis process to determine effects varied by level of attendance. In subsequent subgroup analyses, children with very low attendance were sometimes dropped from the analyses, since they obviously did not receive the full treatment. For example, in one project, first year attendance varied from 25% to 100%. In this case an analyses was done to determine if the experimental/control group comparisons were any different if low-attending children were excluded from the analyses. In another project, attendance varied only from 85% to 95%, so it was clear that attendance would not be a useful explanatory variable in this particular site.

A related measure of treatment was gathered through a parent questionnaire. The *Types of Services Child Has Received* outside of the intervention program being studied were collected from parents via an interview. Such services might have included therapy from private clinicians, participation in other community-based programs, or parental activities in the home independent of the intervention. This information helped to ensure that the intended intervention activities were not contaminated with other non-program interventions, and that differences between groups could be attributed to the variation in the interventions being studied.

Data on the Family

In order to ensure that differences between experimental and control groups were actually due to treatment variation and not characteristics of the home environment, the *Family Demographic Questionnaire* was given to each family prior to intervention with the child and at each annual posttest session. This questionnaire included questions on family pattern, socioeconomic status, race/ethnicity, and age of parents or primary caregivers. Information was also gathered to assist in locating families who moved out of the immediate area.

The home environment plays a crucial role in the progress young children with disabilities can make. To partially capture how involved in the studies' parents became with their child's education, primary intervenors completed the *Quality of Parent Involvement* form to indicate the degree to which families had become actively involved in the intervention process. On a scale of high, medium, and low, intervenors rated the parents' level of attendance at group meetings and conferences; their knowledge of their child's condition and their rights; and their participation in supportive activities, such as school projects, educational activities at home, and volunteer activities. This form was completed at the time other posttest data were collected.

To corroborate the intervenor's measure of family engagement, parents supplied information on the amount of time they spent in intervention-related activities at home. Parents also completed the *Parent Satisfaction Questionnaire* (PSQ) at the time of each posttest to express their opinions about specific aspects of their child's program, including: the teacher, the communication between program and home, the goals and activities of the program, opportunities for parental participation, the range of services available, and their child's progress. Analysis of the PSQ data demonstrated little variation in response across treatments and sites. This is not surprising, since parents tend to like what they have.

Data on The Program.

The Supervisor Ratings of Quality of Staff Services was completed at least once per year. The evaluation assessed teachers' proficiency and skills and provided them with feedback. Those sites which did not have a teacher evaluation system in place used one of the evaluation forms provided by EIRI. One form provided evaluation criteria for several areas considered fundamental to most current teaching practices such as assessment, IEP development, IEP implementation, presentation of instruction, and instructional environment. The other form was designed to provide a gross measure of the quality of the work effort of the teacher. The data obtained from this form were based on the supervisors' perceptions of teachers' skills, problem-solving, work habits, relationships, communication, and attitudes.

In addition, *Qualitative Ratings of Direct Intervenors* was completed annually by the early interventionists' respective direct supervisors. These data were designed to provide information on how service providers compared to a larger peer group of persons in the same or similar positions. These type of data also added to our ability to describe the type of treatment environment which was prevalent during each study. These data were not used by supervisors to evaluate or provide feedback to staff, rather they were used only for data analyses and descriptive purposes.

EIRI Staff Visits and EIRI Staff Telephone Contacts were used for both ongoing technical assistance and informal treatment verification. Site visits by EIRI staff occurred at least twice per year; phone contacts were made weekly. Topics discussed included: random assignment of children, child assessment, curricular issues, management issues, and field testing of new methods.

In most sites, formal *onsite evaluations*, often including professionals not previously associated with EIRI, were conducted annually to collect information about the nature and quality of the early intervention programs collaborating on research studies with EIRI. The site review procedures were designed to also serve as a needs assessment and provided site staff and administrators with useful information on which to base program improvement. Five general areas were included as part of this review: (a) services for children, (b) interactions among staff and children, (c) curriculum, (d) administration and management, and (e) physical arrangements. A more detailed description of the *Onsite Evaluations* procedures and materials is available from EIRI. These procedures were designed by EIRI staff utilizing the TADS *Manual for Comprehensive Accreditation Criteria and Procedures* of the National Academy of Early Childhood Programs, and various Preschool Internal Evaluation Systems which were developed by EIRI staff members.

TECHNICAL ASSISTANCE TO ENSURE THE PROVISION OF HIGH-QUALITY INTERVENTION

Early intervention efficacy research is sometimes criticized on the grounds that research studies are often conducted in university laboratory schools with such high levels of funding that the results are unlikely to be replicated in more typical service delivery settings. A second and even more serious criticism could be offered if research were conducted with programs of such poor quality that they might fail to produce the effects which would have occurred if a better intervention program had been implemented.

To prevent these problems, all of the **Longitudinal Studies** were conducted in conjunction with ongoing service programs willing to expand or vary the services they were providing in a systematic manner which still reflected the "state-of-the-art" practice in the field. Each site was visited frequently by EIRI staff to verify the type and quality of intervention being provided; technical assistance or inservice training was provided where necessary.

ECONOMIC EVALUATION

As noted earlier, a major shortcoming of past early intervention efficacy research has been the failure to consider simultaneously both the effects and costs of intervention. The fact that most studies have ignored costs altogether suggests a tacit assumption that unlimited resources are available for such programs. This is obviously incorrect.

As another example of why both costs and effects need to be considered simultaneously, consider three hypothetical programs which are all designed to reduce the incidence of later special class placement for developmentally delayed preschool children. Program A is the most effective, since 17 of the 20 children are placed in regular programs at first grade, but the cost is $20,000 per participant. Program B is the cheapest at $500 per participant, but only 2 of the 20 children are placed in regular classrooms. In Program C, 14 of 20 children are placed in regular classrooms at a cost of $2,000 per participant. If an administrator wanted to pay as little as possible for the program, B might be selected. Unfortunately, little benefit would be realized. In a society with unlimited resources for such programs, Program A would probably be the method of choice because it is the most effective. However, in a more realistic situation where resources are limited, Program C would probably be preferred. Although rates of placement in regular classrooms are somewhat lower for Program C, the cost of the program is a fraction of the cost of Program A. Thus, neither the most effective nor the cheapest program is the most cost-effective alternative.

Accounting for the costs of a particular early intervention program is more complex than taking the budget for that program and dividing it by the number of children served. Instead, as was done in each of the **Longitudinal Studies**, it is crucial to account for shared and contributed costs, as well as to use standard economic techniques for calculating difficult-to-estimate costs, discounting, judging the robustness of economic assumptions, and figuring benefits. Economic evaluation of social service programs is a relatively new field but one which is becoming increasingly important as people realize that we do not have unlimited resources for providing such services.

The Purpose of Economic Analyses

From an economic perspective, early intervention is an investment in the lives of children with disabilities and their families. Despite popular belief in the "cost-effectiveness" of early intervention programs, relatively few economic analyses have been conducted. When these studies were initiated, only 16 economic analyses had been conducted in early intervention studies that included young children with disabilities, and the majority of these were methodologically problematic (Barnett & Escobar, 1987, 1988). If research is to inform policy and assist the practical application of early intervention, the short- and long-term costs and benefits of programs generally, and of specific alternative approaches, need to be fully understood and documented. Consequently, a part of the design for this set of longitudinal studies focused on establishing criteria for conducting economic analyses of early intervention programs that adhered to economic conventions, developing new methods to address problems specific to early intervention research (Escobar, Barnett, & Keith, 1988), and conducting new economic analyses of early intervention. The remainder of this section presents a brief overview of rationale and techniques used in the economic analyses for this set of early intervention studies.

The primary purpose of economic analysis is to assess **economic efficiency**. An early intervention program that is economically efficient produces a greater gain than loss (net gain) to society as a whole. Efficiency is always assessed comparatively; the most efficient program is the one with the greatest net gain. Economic analysis can also be used to assess **equity** by describing the distribution of costs and benefits of a program. However, the purpose of economic analysis with respect to equity is purely descriptive because there are no economic criteria of equity. Consumers of the analysis are left to rely on their own values to judge the fairness of the distributional consequences.

Different Types of Economic Analyses

Two types of economic analyses are most relevant to the **Longitudinal Studies**: cost-effectiveness and cost-benefit analysis. Cost-effectiveness analysis (CEA) is a way to investigate the relationship between the costs and outcomes of one program compared to those of one or more alternative programs: the dollar value of the resources that go into the program are estimated and compared to outcomes. CEA is most useful in considering alternative strategies to address the same problem. Programs can then be compared on how much they accomplish with each dollar invested in them.

The comparison of costs and effects differs between cost-effectiveness (CE) and cost-benefit analysis (CBA). CE analysis uses a series of matrices that display the costs and effects of each intervention. A hypothetical cost-effectiveness matrix is given in Table I.5. Such a matrix displays the relative strengths and weaknesses of each of the interventions in an easily read format. Program C, for example, is associated with more motor skills and positive responses than are programs A or B. However, Program C has higher costs and lower developmental quotients (DQs). The matrix approach allows several different comparisons to be made on program costs and effects. For example, costs can be separated by the

Table I.5

Hypothetical CE Matrix for DQ, Motor Skills, and Positive Responses Across Three Interventions (A, B, C)

	Cost Per Child			Effects			
	Total	Parents	Project	DQ[a]	Skills[b]	Responses[c]	Satisfaction[d]
A	1,050	550	500	3	12	15	4
B	1,750	1,400	350	9	5	4	5
C	1,800	600	1,300	0	20	17	9

[a] Mean gain in DQ
[b] Mean number of skills mastered
[c] Mean number of positive responses in one trial
[d] Mean satisfaction-with-program score on a 10-point scale where 10 is positive and 1 is negative

groups bearing the expense of the resource, or effects can be displayed according to the type of disability, severity of disability, or age served.

This analysis and display procedure is used instead of the direct computation of simple cost-effectiveness ratios for several reasons. First, it may be inappropriate for the evaluators to decide which cost breakdowns and effects are the most important. For instance, some persons may value parent satisfaction more highly than others. Some may value gains in DQ more highly than anything else. In another instance, a CE comparison disregarding parent time may be desired (if one wants to know what is feasible based on public school resources, for example). The ultimate cost-effectiveness comparisons must be left to the decision-making body. Second, this format displays the distribution of the intervention costs and effects. For example, in Table I.5, the parents in Program B bear more of the costs than do parents in Program A or C. However, the parents in Program C report higher satisfaction than parents in Program A or B. This disaggregation provides decision-makers with valuable information about political and social impacts of the program and potential disincentives or incentives to parent participation. Third, the matrices are easily comprehended by readers without an economics background. Thus, the data are available to a wide audience, increasing the usefulness of the cost-effectiveness data. Fourth, cost-effectiveness ratios do not provide a reliable ranking of programs in terms of economic efficiency (Barnett, 1986).

Cost-benefit analysis (CBA) is a way to compare the dollar value of a program's benefits (outcomes) to the dollar value of its costs. In addition to the complete estimation of program costs, CBA requires the comprehensive measurement of program effects, and, whenever possible, an estimation of their monetary value. CBA is often only partially completed because many program effects are intangible, and, thus, difficult to value in a monetary sense.

Cost-benefit analysis is most germane when the economic implications of outcomes can be readily estimated. For instance, a program which reduces the need for special education or expensive therapy produces benefits to society that can at least be roughly estimated. Because the process of estimating the dollar value of intervention outcomes is almost always incomplete, it yields a conservative estimate of the net economic return to society. However, such analyses can be accomplished to a much greater extent than often supposed, as demonstrated by the economic analysis of the Perry Preschool Project (Barnett, 1985a; 1985b). For early intervention research, three types of measures can be used to quantify the benefits of early intervention.

Savings in costs of care and education. One measure of benefits is the cost savings generated by increasing the capacities of preschoolers with disabilities, or improving the efficiency of the service delivery system. These cost savings may derive from: organizational, procedural, or staff changes that reduce intervention costs; a reduction in intensity or duration of later special services; or an intervention that provides a better transition to later services and so increases productivity or reduces cost. For example, the Perry Preschool Study analyzed cost savings in education and social services (Barnett, 1985; Berrueta-Clement et al., 1984). Significant cost differences were observed as early as two and three years after intervention. Seitz, Rosenbaum, and Apfel (1985) found similar kinds of educational savings from an intervention program that focused on families and began at birth.

Cost savings to households. Families with children with disabilities have substantially higher child-related expenses of time and money than families without children with disabilities. This applies to many ordinary activities as well as to special activities not required for children without disabilities. One way that we can measure cost savings is to compare time use and out-of-pocket expenditures for sample families participating in interventions.

Willingness-to-pay by households. The most complete benefit estimation procedures estimate the value of an intervention program and its effects to families beyond cost savings discussed above. Techniques used to produce more complete estimates of benefits are classed as either (1) "hedonic" approaches or (2) direct measures of willingness-to-pay. The hedonic approach involves the estimation of a "household production function" based on expenditures of money and time by household members on various goods and services (Lancaster, 1966), or the identification of differing prices or wages accepted in order to participate in the activity. Estimation of a household production function can involve difficult theoretical and empirical problems and requires relatively large amounts of detailed data collection from families (Barnett, 1977; 1983; Muellbauer, 1974; Pollack & Wachter, 1975).

The second approach to valuation, direct elicitation of willingness-to-pay through "bidding games," might also be successfully applied to early intervention programs and their effects. However, strategic and other biases which are often suspected in hypothetical responses may be a problem. Also, it is sometimes difficult to elicit responses from individuals in cases where very detailed descriptions of the "game" must be used; this would be the case for valuing specific treatment variations in intervention components. The economic analysis staff have developed possible solutions to these problems, however, and have had some success in using this approach. For example, Escobar et al. (1988) were able to obtain reasonable estimates of parents' valuation of a preschool program for children with disabilities. These estimates were highly consistent with predictions based upon economic theory.

Procedures for Collecting Cost Data

Economic analysis requires that the components of each alternative treatment be clearly specified. Procedures for collecting detailed cost data for each of the sites included in the **Longitudinal Studies** were developed, tested, and implemented at all of the study sites. Using all available sources (e.g., written documents and interviews with project staff), a detailed description was drawn up for each intervention. Descriptive data included: (a) number of children by age, disability, severity, and developmental level; (b) number of direct servicc staff, administrators, and volunteers; (c) other resources used in the intervention program; and (d) type and extent of parent involvement. These data were combined with information on the unit costs of resources to produce estimates of total program cost and cost per child.

The primary reason that economic evaluation requires a specialized cost data collection system is that project budgets usually do not accurately reflect the total costs of a program. For instance, the value of parent time is often not included as a cost in project budgets. Yet, the care and education of a preschooler with a disability requires extraordinary amounts of a family's resources, especially parent time, under any circumstances. Parents with children with disabilities who participate in interventions may be expected to contribute significantly greater amounts of their time than other parents. Indeed, parent participation in development of the Individualized Education Plans (IEPs) alone may consume nontrivial amounts of time. These time costs are important for more than economic comparisons; if time costs are sufficiently high, they may be a barrier to participation for some parents (particularly low-income, single parents). Other resources that are frequently not found in budgets are the costs of initial staff training and set-up for a new program, "borrowed" staff, volunteers, and even facility costs. To overcome the problems with using budget figures, the costs of implementing each of the interventions studied were defined and measured using the "ingredients" method proposed by Levin (1975, 1983).

The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. Using this approach, an exhaustive list of resources used by each alternative intervention program was developed, and the ingredients were costed according to observed market values (e.g., salaries) or estimated market values (e.g., parent time). In some cases, it was necessary to prorate shared costs of a resource; for example, by estimating the proportional costs to one program using a building that was shared with another program. Costs were then distributed according to constituencies, adjustments were made for transfer payments (transfer payments are shifts in income like taxes and welfare payments that are not net costs to society as a whole), and total net costs were calculated. Using this approach, it was possible to ascertain the overall costs for each alternative program as well as the costs to various contributing groups.

Since the concepts and skills involved in economic analysis are relatively new, most site staff were unfamiliar with the procedures. Consequently, cost data collection forms were developed, tested, and revised so that they did not require a background in economic analysis to generate accurate cost data. EIRI economists were available for assistance in computing the forms. The forms were returned to EIRI for analysis and further interaction with the site if any problems or inconsistencies were noted.

Described next are the general resource categories that were used for each site. More specific information about the overall costs and cost per child for each of the following resource categories for each site are contained later in this report.

Personnel. Cost for program personnel was divided into direct service, administrative, consultants, volunteer, and parent time costs. Direct service and administrative costs included salary plus benefits according to the portion of FTE devoted to the alternative early intervention program. Consultant time was calculated based upon their daily rate. Volunteer and parent time was valued at $9 per hour, the U.S. average wage (U.S. Department of Labor, 1989). Professional volunteers were estimated at $25 per hour. In most cases, parent time is based upon the number of hours parents were required to commit to the programs, for attending center- or home-based programs, or in phone calls with program staff. Although we know that most parents conducted intervention activities at home with their child, we usually did not attempt to estimate how much time was spent because too much uncertainty was involved. However, for those programs that outlined specific home intervention activities for parents to carry out, we did estimate parent time based upon the time recommended by the program. Thus, we provided an estimate of how much time parents would have spent if they adhered to the program at home. In all cases, we provided program cost estimates with and without the value of parent and volunteer time.

Capital assets. Facilities, vehicles, equipment, and other investments in items with more than a 1-year life are capital assets. Their costs need to be apportioned to the relevant time period (e.g., 1987-88 school year). Annual capital costs were estimated in one of three ways: (1) the replacement cost of the capital was determined and then multiplied by an annualization factor that accounted for implicit interest and depreciation on the item (Levin, 1983); (2) annual rental cost was used; or (3) the indirect rate (for intervention programs housed in universities) was used.

Transportation. Annual staff and child transportation costs were reported by each early intervention program. Staff travel included any job-related travel paid for by the program, such as home visits, travel between centers, any air travel, and consultant travel. Child transportation may or may not have been provided by the program. Parents who used their own resources to transport their child or themselves for intervention services were phone interviewed. In the interview, they were asked the round-trip distance they were required to travel, the number of trips made, travel time, and whether or not they car-pooled. Based upon this information, parents' transportation costs were estimated at $.21 per mile and $9 per hour. In all analyses, transportation costs were estimated with and without parent costs.

Materials and supplies. Each program reported annual expenditures on consumable items (expected life of 1 year or less). This included office, classroom, and custodial materials and supplies.

Miscellaneous. Annual expenditures on anything not counted elsewhere were included in this category. These may include utilities, insurance, debt service, dues, subscriptions, etc.

Design/Analyses Issues

Most of the issues related to design and analyses are described adequately in the individual reports of the 17 **Longitudinal Studies**. There are several issues which cut across studies, however, which merit further discussion here.

ATTRITION

Attrition is one of the most serious challenges associated with conducting longitudinal research. Although the analysis techniques for attempting to deal with attrition once it has occurred are relatively straightforward and non-controversial (Jurs & Glass, 1971), the best approach is to do everything possible to prevent attrition from occurring. Consequently, EIRI staff employed a number of strategies for preventing the occurrence of attrition.

Payment to parents. The original plan for the studies called for paying an incentive for participation only to parents in the "experimental" groups. However, because attrition is just as serious whether it occurs in the "experimental" group or the "control" group, it was decided to pay all parents an incentive for completing the annual assessment battery (this ranged from $25 - $50, depending on the study). Money obtained from the National Institute of Child Health and Human Development for broadening assessment activities made this possible.

Liaisons with service provider. An important strategy for avoiding attrition was to develop and nurture a feeling of commitment to the project among those who were participating. A key link in this strategy was the service provider. Nurturing a positive attitude toward the research among key staff of the service provider was essential because these are the people who had the most frequent contact with the participants in each study. Such feelings of commitment were fostered by frequent and consistent communication with the service provider staff about the research activities, opportunities for interested service provider staff to participate in the publication of data from the research project, provision of technical assistance to the service provider in upgrading their program, and assistance to the service provider in identifying additional funds for expanding and strengthening the services they provided.

Communication with parents. Although EIRI staff had to depend on the service provider staff for the week-to-week contact with participating families, EIRI staff tried to communicate the following three messages to parents: (1) each person will benefit from participating; (2) participation with benefit others in the future; and (3) research staff will be responsive to concerns of parents and will keep parents and family informed about the results of the research. These messages were initially communicated to parents via the informed consent form and during the pretesting assessments. In addition, parents were fully informed as to their roles and responsibilities, given explicit examples of what their time commitments would be, and were informed of measures and precautions taken to ensure their family's safety and privacy.

Other tangible incentives. In addition to the monetary incentives paid to parents for cooperating with the annual assessment, several other tangible incentives were used to maintain cooperation. Developmental toys, subscriptions to magazines, coupons for McDonalds, and infant formula were given to parents in different projects. Whenever such incentives were used, it was balanced across the two alternative groups.

Locating difficult-to-find families. The activities described above provided numerous opportunities each year to have contact with parents. For those parents who "became lost" during the year, a number of techniques were immediately implemented to locate them. The first was the locator service provided through the U.S. Postal Service. For a nominal charge ($1 per family), the Post Office provided information about any forwarding address that had been left. Second, neighbors and relatives whose names had been provided by the parents as part of the demographic information completed at the beginning of the project were contacted. These people oftentimes had information about where the family had moved.

Using the techniques described above, many sites were able to retain most of the subjects initially enrolled. In cases where substantial attrition occurred, analysis techniques were used to make whatever adjustments were possible.

COLLECTION OF PRETEST DATA

The original proposal did not envision the collection of extensive pretest data. However, the results of the feasibility studies conducted during the first year made it clear that pretest data were essential for three important reasons. First, it is clear that some children and families appear to benefit more from early intervention services than do others; the critical question is why these differential benefits occur. Pretest measures on family structure and functioning, home environment, and child functioning were included in the core assessment battery in order to examine some of the possible reasons for the differential effect of early intervention. For example, it was hypothesized that for financially secure, high-functioning, relatively healthy and intact families, early intervention might add very little to a child's developmental progress. For families which are overly stressed, disorganized, or lacking adequate resources, intervention may be particularly beneficial. Pretest data on child and family functioning were used in conjunction with the demographic data already planned for collection to investigate several such hypotheses.

A second reason for collecting pretest data was demonstrated by the findings of the integrative review summarized earlier in the report. This analysis demonstrated that a great deal of the current research about the efficacy of early intervention for children with disabilities is based on pretest/posttest design in which children make more growth than the investigators anticipated. A number of popular and widely disseminated arguments for using such designs to estimate the impact of intervention have been advanced (see for example, Bagnato & Neisworth, 1980; Carr, 1979; Simeonsson, Huntington, Short, & Ware, 1982; Simeonsson & Weigerink, 1975; and Wolery, 1983). Based on data collected during the feasibility studies, it became clear that such estimates of intervention impact can sometimes be misleading. For example, if the study in Utah investigating the effects of parent involvement had been done using a one-group pretest/posttest design, the conclusion would have been that involving parents in this way was a very effective strategy since children with moderate to severe disabilities who were functioning at about 60% of their chronological age made approximately one month of growth for every month of intervention. However, the presence of a control group in this study demonstrated that children in both groups (i.e., the group with parent involvement and the group without parent involvement) made approximately the same amount of pretest to posttest growth. Thus, the collection of more extensive pretest data in each study allowed such questions to be more thoroughly addressed.

Finally, the original proposal included a plan to use analysis of covariance techniques to increase the statistical power of each study. Various demographic indices were planned for use as covariates. However, during the feasibility studies conducted in the first year, it became clear that such covariates would have limited utility. Since each of the **Longitudinal Studies** had relatively small sample sizes (20-35 subjects per group), analysis of covariance was very important to substantially increase the statistical power of each study to a more reasonable level. The expansion of pretest measures over what was originally planned made it possible to use analysis of covariance much more successfully for increasing the statistical power of the analyses.

ESTABLISHING ALPHA LEVELS AND EDUCATIONAL SIGNIFICANCE

Statistical significance testing should be viewed as a means toward and end, not as an end in itself. As Winch and Campbell (1969) pointed out, statistical significance testing provides a good means of determining whether observed differences between the groups are larger than would have been expected as a function of sampling fluctuation. However, it is clear that statements about statistical significance (i.e., the Type I error) cannot be made in the absence of considerations about statistical power (i.e., the Type II error). As pointed out by Hopkins (1973), too many people, attempting to be rigorous, set the probability level for Type I errors at .01, ignoring the fact that the probability of making a Type II error (i.e., failing to detect true differences) may be 60% or 70%. A much better strategy is to attempt to balance Type I and Type II errors.

In order to achieve such a balance, Alpha levels in each of the studies will be set at .05 or .10 for one-tailed tests of significance, depending on the number of subjects included in that analysis and the availability of effective covariates. Related to the issue of how to set Alpha levels for the testing of any single hypothesis is the issue of how to interpret the pattern of statistical significance tests across a wide range of dependent variables (and subtests within those variables) for a given study. For example, in all of these studies, there are dozens of different tests of statistical significance. Obviously, several statistically significant differences would be expected by chance alone. Thus, it is important to examine the pattern and logical consistence of differences and not rely on a magical number for Alpha to establish statistical significance. Furthermore, as pointed out by Gabriel and Hopkins (1974), appealing to multivariate analysis of variance (MANOVA) techniques as a solution to the multiple dependent variable problem is too simplistic and not very convincing. The only real solution is to use statistical significance as a tool in examining the pattern of differences, while at the same time considering the logical consistency of results, the magnitude of differences, the consistency of results from year to year, and the results of other studies in the group which provide evidence about similar questions.

PART II. RESULTS OF INDIVIDUAL STUDIES

Seventeen separate studies were completed as a part of the **Longitudinal Studies of the Effects and Costs of Early Intervention with Handicapped Children.** To facilitate comparisons between studies, a similar format has been followed wherever possible. It is emphasized that because additional data continue to be collected and more analyses are being done, the tentative conclusions of this report may change. The purpose of this document is to describe what has been done so far as a means of generating discussion and suggestions which will improve the interpretability of the **Longitudinal Studies.**

The presentation of studies are divided into three categories:

- Studies in which ***intensity*** of the intervention varied.
- Studies with ***medically fragile*** infants in which the age-at-start of the intervention varied.
- Studies in which different programmatic features, primarily ***parent involvement***, varied.

The results for each category of study is preceded by a review of the research conducted by other researchers which is relevant to the studies in that category. These reviews are the most comprehensive reviews on each of these topics yet done, and the information in them provides an extremely important context in which to interpret the results of these studies.

REVIEW OF EARLY INTERVENTION RESEARCH ON THE INTENSITY OF EARLY INTERVENTION

It has been argued that the field of early intervention must stop asking the research question, "Is early intervention effective?" and focus on research questions that examine the conditions under which different interventions are effective and for whom they are effective (Dunst, Snyder, & Mankinen, 1989; Farran, 1990; Guralnick, 1988; Meisels, 1984; Reynolds, Egan, & Lerner, 1983). This argument seems logical. Even the most critical reviewers of the early intervention research literature have stated, with provisions, that early intervention seems to make an immediate impact on child developmental progress (Casto & Mastropieri, 1986; Dunst et al., 1989). However, as Dunst et al. (1980) have stated, "The extent to which the interventions are responsible for observed effects is difficult to ascertain" (p. 285). The change in a research focus from the general question to specific questions would provide clearer evidence by which to ascertain cause/effect relations and by which to implement intervention programs.

The review article of Handicapped Children's Early Education Program (HCEEP) funded projects that have received Joint Dissemination Review Panel (JDRP) approval (White et al., 1984) can serve as an example of the current state of early intervention research. JDRP approval is considered a rigorous process, and projects which gain this approval are considered to be well developed and thoroughly evaluated (Odom & Fewell, 1983). At the time White et al. conducted their review, 21 early intervention projects had received JDRP approval. Characteristics of these projects were: 7 were home-based, 8 center-based, and 6 combined home- and center-based services; 7 projects heavily involved parents, 10 involved parents to some extent, 4 did not involve parents; 12 served children with mixed handicaps, 9 served more specific populations; the ages of children served by projects varied from 0 -6 to 4 - 6 with many permutations; and programs provided from one hour per week of intervention to five days per week, 3 hours per day intervention. With such a variety of "effective" intervention formats to choose from, how is an early intervention provider to select a model to implement? Factors such as funds, advocacy, and personal beliefs enter into selecting an intervention program. If the results of more rigorously designed research were available to answer specific questions about what works best for whom, then the early intervention provider could select an intervention program(s) based on factors such as types of disabilities, ages of children, and background of families to be served.

This suggested change in the focus of early intervention research is one toward examining the parametric aspects of early intervention programs. Parametric, in this context, refers to the limits or boundaries of a field of study. This process is analogous to what Kuhn (1970) has referred to as "normal science" in the physical sciences. This process starts with a proposition or belief (e.g., early intervention is effective), referred to as a paradigm by Kuhn. The role of a field or inquiry is then to examine the limits and boundaries (the parametric aspects) of this paradigm.

It is clear that early intervention research cannot conduct normal science in the way that many physical sciences do. Early intervention research has been implemented in an atheoretical manner, and problems with causality will always be present (Dunst, 1986; Dunst et al., 1989; Halpern, 1984). These aspects of early intervention research separate it from the path that most physical sciences take in their approach to "normal science." However, this type of path would allow the field of early intervention to address concerns raised from within and outside the field of early intervention (Odom & Warren, 1988; Summers & Innocenti, in press).

If this parametric approach to early intervention research is accepted, the question of what parametric factors require examination is raised. The answer to this question is too extensive to be explored thoroughly here, but the paradigm proposed by Dunst et al. (1989) provides one useful approach. Dunst et al. (1989)

suggested that the most important factors include intervention program characteristics, aspects of social support, family characteristics, and child characteristics. Within and across these characteristic, the list of possible parametric questions is inexhaustible. This review will focus on the early intervention characteristics of intensity.

Intensity as a Parametric Variable

Information on the parametric aspects of intensity as it relates to a paradigm are usually examined from a variety of perspectives. For example, in operant psychology extensive information is known regarding intensity factors needed to establish the phenomenon of stimulus control (Mackintosh, 1977). In early intervention, however, little systematic research has occurred in regard to intensity, although it is often cited as an important treatment variable (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; Dunst et al., 1989). The field of early intervention commonly holds the belief that "more is better" (White, Bush, & Casto, 1985-86). This belief is common to our culture in many areas but may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986).

There is a need for a definition of the term intensity if it is to be systematically investigated. Many reviewers of early intervention research fail to clearly define what is implied by the term intensity (Dunst et al., 1989; Reynolds et al., 1983; White et al., 1985-86). Those who have defined intensity have done so in slightly different ways. Bryant and Ramey (1987) defined intensity "by amount and breadth of contact with children and/or families" (p. 71). This definition implies some qualitative aspects of intervention. Casto and Mastropieri (1986) defined intensity both in terms of total hours of intervention and hours per week of intervention. This definition implies aspects of both amount and duration.

For the purposes of this review, intensity is defined solely from an amount perspective. That is, intensity is defined as hours of intervention contact, with child and/or parent, by an interventionist provided within a constant time frame (e.g., within a one-week period). This differs from duration, which is the length of time intervention is provided over an unlimited time frame. An example may be useful. A program that provides three hours of intervention per week versus one that provides five hours per week is an example of an intensity difference. If there are two programs of equal intensity and one provides three months of intervention while the other provides 12 months, the difference is one of duration.

It is clear that this definition is not without problems. Duration and intensity are frequently confounded, as are many other aspects of intervention programs (e.g., age at start). Qualitative aspects of programs do impact on intensity (cf., Carta, Sainato, & Greenwood, 1988). These issues will be discussed later in the review. The goal of this review is to examine the general proposition that "more is better" and determine if available evidence supports or refutes this proposition.

The Importance of Intensity

With the passage of P.L. 99-457, there has been an increase in the number of early intervention programs. When developing a program, program administrators must address a variety of issues, but two basic ones are how many days per week and how many hours per day services will be provided. In the absence of empirical findings, administrators will be forced to rely on factors such as personal philosophy, efforts of advocates, and examples of already established intervention programs. These factors are all valid, but may not be enough to answer the questions correctly.

Odom and Warren (1988) have discussed the potential institutionalization of intervention services and the possible drawbacks this would have on effective services. Barnett (1988) takes this institutionalization scenario into the cost realm. Barnett presents different cost scenarios based on different service delivery patterns. It is clear from his analysis that information on efficacious program intensities for different groups could allow funds to be spent more effectively in serving children. Essentially, more accurate information or intervention intensity for specific groups would allow "more bang for the buck."

A second major issue related to the intensity of intervention has to do with the way in which interventionists are trained (see Odom & Warren, 1988). One of the strengths of early intervention programs, prior to P.L. 99-457, has been their ability to individualize according to the needs of the population being served. It is possible that there may be a limit to what a child with disabilities can learn in a structured session, and that this limit may vary depending on degree or type of disability. Also, it is possible that some families find more intense programs detrimental to child and family functioning. If interventionists are trained to provide services through one intervention format (e.g., 5-days-per-week, 3 hours per day, or a 1.5 hour home visits per week), then the individualization aspects of early intervention may become less salient.

Shonkoff and colleagues (Shonkoff, Hauser-Cram, Krauss, & Upshur, 1990) have addressed some of these concerns in their report on the Early Intervention Collaborative Study. They found that program variables were not always meeting child and family needs and questioned these factors in relation to the Individual Family Services Plan (IFSP). If research on intervention intensity were available, then interventionists would be better able to provide appropriate, individualized intervention. However, training for the interventionist to make judgments regarding program intensity is predicated by the availability of research to shape training programs.

EVIDENCE FROM PREVIOUS REVIEWS

White et al. (1985-86) criticized researchers who conducted reviews that failed to build upon earlier reviews. In order to learn from the information contained in previous reviews, a review of reviews of the early intervention efficacy literature that provided conclusions regarding intensity was conducted. To make it more manageable, only published reviews conducted after 1970 were examined.

This process began through an examination of the White et al. (1985-86) review. White et al. identified 22 out of 52 reviews which cited duration/intensity as a concomitant variable in early intervention efficacy research. These reviews were obtained. Upon closer examination of these reviews, it was determined that the majority of these dealt with the duration variable and not intensity. Of these 22 reviews, only four dealt with intensity as a variable. Two of these reviews did not meet the above criteria for selection (Groteberg, 1969; Ragghianti, undated). The other two reviews (Ramey & Bryant, 1982; Reynolds et al., 1983) were obtained.

In order to augment these reviews, a literature search was conducted for reviews of early intervention efficacy published between 1985 and 1989 and that provided conclusions regarding intensity. Three reviews were identified (Bryant & Ramey, 1987; Casto & Mastropieri, 1986; Dunst et al., 1989). Two of these were "traditional" reviews (Bryant & Ramey, 1987; Dunst et al., 1989), and one was a meta-analytic review (Casto & Mastropieri, 1986) based on the use of study effect sizes (Glass, 1976).

In total, five reviews were identified which provided conclusions regarding the intensity of early intervention programs. The review by Bryant and Ramey (1987) was an expansion of the argument presented in their earlier article (Ramey & Bryant, 1982); thus, the more recent article was deemed a better representation of their position on intensity. This results in a pool of four articles for this review of reviews (Bryant & Ramey, 1987; Casto & Mastropieri, 1986; Dunst et al., 1989; Reynolds et al., 1983). Each of these reviews will be examined by the evidence presented regarding intensity. "Traditional" reviews will be examined first and then the review based on effect size analyses.

Bryant and Ramey (1987). This review consists of an analysis of 17 compensatory early education research studies. Only studies that were described as true experiments (i.e., a matched or randomly assigned intervention group versus a nonintervention or less intervention group). Children in these studies were from economically disadvantaged families. Twelve of the programs were infant/toddler programs and five were preschool programs. Programs varied in terms of center- or home-based intervention, and in degree of child and parent focus. The focus of the analysis was on changes in IQ scores.

Bryant and Ramey, as part of their review, examined 11 studies which began in infancy and calculated the difference in IQ between the experimental and control group when the children were 24 months old. Ramey and Bryant ranked the studies according to observed differences and the intensity of the intervention. They concluded that the rankings of outcome corresponded to the intensity of the intervention program, as defined by number of project hours per month with parents and/or children. Bryant and Ramey stated: "Taken all together, the 2-year results from the 11 infancy interventions support an intensity hypothesis" (p. 65).

The same process was repeated with the 10 studies of infants that provided results from the children at age 3. This process produced essentially the same conclusion. The strongest effects clearly favored the three most intensive intervention programs. However, treatment effects were not as clearly related to intensity differences for the other seven studies of the group. Problems were reported with this analysis partly because of the absolute IQ scores of most subjects in these studies (the majority were in the average range) and because many studies changed tests between the 2 and 3 year assessments.

In an analysis of preschool results, Bryant and Ramey presented IQ difference scores for the five preschool studies, two of the infant studies that continued to provide services in the preschool years (full-day daycare), and two studies that continued to collect follow-up data but provided no services. Although Bryant and Ramey do not discuss the intensity hypothesis in regard to these data, it is clear that the intensity hypothesis breaks down. Although all children who entered the preschool programs made progress, the progress was not clearly related to program intensity. In fact, subjects in the most intensive preschool program (30 contact hours per week in the Curriculum Comparison Study [Miller & Dyer, 1975]) made the least IQ gain of all the preschool interventions. Further, the infancy projects that continued into the preschool years, and were the most intense in terms of contact hours, demonstrated the least effects.

In their conclusions, Bryant and Ramey stated: "The preponderance of evidence seems to suggest that the intensity of programs...is likely to have a direct and positive relationship to the degree of intellectual benefit derived by children participating in such programs" (p. 71); and "...if systematic education is provided, intellectual levels can be boosted by modest to quite dramatic amounts, depending primarily upon the intensity of the educational treatment" (p. 74). The data they present clearly support these conclusions based on the programs reviewed that began in infancy. However, these statements are not supported by the data from programs begun at the preschool level. It is also questionable whether these early differences maintain for the infancy programs past 3 years of age.

Overall, this review is excellent in its selection of studies and the procedures used in the review. The conclusions regarding intensity, however, appear to be much stronger than the data warrant. Support is provided for the intensity hypothesis, but this support needs to be qualified.

Dunst et al. (1989). Dunst and colleagues take a different approach to the traditional review in their article. Articles selected for review by Dunst et al. were separated into 14 groups based on the degree of causality that could be inferred from the study. The review then discussed studies within each group.

Dunst and colleagues discussion of intensity is addressed within the group 14 studies; the group with the highest level of causality. Seven studies were included in this group. Five of these seven studies had been included in the Bryant and Ramey (1987) review. Dunst et al. also included the Lazar and Darlington (1982) monograph which Bryant and Ramey had not done. The Lazar and Darlington (1982) monograph is an evaluation of 11 separate early intervention studies. Bryant and Ramey had used some of the individual studies included in this monograph in their review article. The other study selected by Dunst et al. was one which compared home-based intervention to a nonintervention group (Cappleman, Thompson, DeRemer-Sulliran, & King, 1982). All of the studies considered by Dunst as having the highest level of causality focused on environmentally at-risk children as subjects.

The argument presented by Dunst et al. supporting the intensity hypothesis is essentially the same as that presented by Bryant and Ramey (1987), although Bryant and Ramey explicated their arguments in much greater detail. In discussing these studies, Dunst et al. stated: "At least in terms of IQ differences between the experimental and control groups, the data from these studies support the intensity hypothesis" (p. 284). However, the specific logic by which Dunst et al. reach this conclusion and the evidence upon which it is based is not clear. Dunst et al. are also more qualified in their overall conclusions regarding intervention-related variables, which include intensity. They stated in regard to these variables that, "...these variables tend to have conditional effects. For example, intensity of involvement appears important in center-based programs with minimal parent involvement but is less important in home-based programs, where parents function as 'teachers' of their own children" (p. 286). Again, the specific evidence on which this qualification is based is unclear. The inclusion of the Cappleman et al. (1982) and Lazar and Darlington (1982) monograph is not clear from an intensity perspective. Both articles report the results of methodologically well-designed research, and both demonstrate that some intervention is better than no intervention. However, neither article would readily fit into the Bryant and Ramey (1987) analyses. Regardless, the review by Dunst et al. is useful. However, it is difficult to tell how strong the evidence is on which they base their qualified views on the role of intensity as a program variable. Dunst and colleagues also make clear the need for parametric research on program variables in their conclusions.

Reynolds et al. (1983). Reynolds and colleagues review focused on the efficacy of early intervention on preacademic deficits. Reynolds et al. took a neutral stance in regard to intensity of intervention, citing only the 1982 review by Ramey and Bryant. These authors suggest that this may be an important variable, but that more controlled studies were needed. Reynold et al. were also cautious in their conclusions and stated that there were few studies of specific intervention variables.

Casto and Mastropieri (1986). A number of recent reviews have focused on the use of effect sizes to assess variables that may impact on the efficacy of early intervention (Casto & Mastropieri, 1986; Casto & White, 1985; Shonkoff & Hauser-Cram, 1987; White & Casto, 1985). In these reviews, a single effect size or multiple effect sizes (Glass, 1976) are obtained from existing research articles. The research articles are also coded according to different variables on which the review will focus. The effect size then serves as a common metric for comparisons of these selected variables across studies. This type of review is referred to as a meta-analysis (Glass, 1976; Jackson, 1980).

The meta-analysis conducted by Casto and Mastropieri is unique in that it focused solely on children with disabilities and addressed the program intensity variable. Casto and Mastropieri examined intensity both from a total hours of intervention and an hours of intervention per week perspective. The data presented indicated a clear trend in favor of the intensity hypothesis. These authors suggested that intensity/duration may be an important variable for disabled populations.

Although this analysis has merit, it is not without problems. The analysis combined intensity and duration, and the clearer data were those dealing with duration (total hours). For example, the duration effect sizes were presented adjusted for quality of measurement, age at start, and time of measurement. Intensity (hours of intervention per week) adjusted effect sizes were not presented.

In addition, although a trend favoring more intense studies was present, the standard error of the mean for the mean effect sizes presented was very large, suggesting that findings in this area were not uniform. These problems suggest that any statements regarding intensity, without duration included, should be equivocal.

Conclusions From the Review of Reviews

The reviews examined were, overall, supportive of the position that more intense intervention programs result in greater developmental gains for children than less intensive programs. It seems that the research articles reviewed do provide some support for this proposition. However, the strength of the evidence regarding this hypothesis is limited, and there are clearly some qualifications that need to be made regarding the proposition that more intense interventions are more effective. Neither the Bryant and Ramey (1987) nor Casto and Mastropieri (1986) reviews, which present the more thorough analyses of the intensity variable, present data that are without criticism or competing hypothesis. The qualified conclusions by Dunst et al. (1989) appear to be the most accurate. Overall, these reviews suggest the need for more information and research on intensity as an early intervention efficacy variable.

REANALYSIS OF THE EIRI LITERATURE BASE

One method to obtain more information on intensity as an early intervention efficacy variable would be to conduct a meta-analysis (Glass, 1976), similar to that completed by Casto and Mastropieri (1986), with categories more specific to the intensity variable. The data base of results from previously reported research that had been compiled by the Early Intervention Research Institute (EIRI) at Utah State University for use in meta-analytic reviews was accessed for this purpose. More specific information on this data base and methods used to code studies can be found elsewhere (Casto & Mastropieri, 1986; Casto & White, 1985; White & Casto, 1985).

The EIRI article data base was accessed in Fall, 1989. All articles (over 400 research studies) were examined for the intensity variable of hours per week of intervention. This analysis included all of the studies analyzed previously by Casto and Mastropieri (1986) in addition to studies added to the data base since their analyses were completed. All studies from which this factor could be gleaned were taken, rated according to methodological quality (based on threats to internal validity), and effect sizes were obtained from the results presented (see Casto & White, 1985, for more specific information on coding of articles). Intensity factors were not under examination (i.e., an independent variable) in the majority of this research, but information was presented that allowed intensity information to be obtained. These data are presented in Table II.1. Findings are presented by type of population included in the study; that is, children identified as disabled, children at-risk because of economic or environmental factors (disadvantaged), and children medically at-risk.

If it is assumed that intensity is directly related to program efficacy in terms of child outcomes, then a relationship would be expected between level of intensity and child progress--with increasing effects as children receive more intensive interventions. The data presented in Table II.1[1] do not support this assumption for any of the populations presented. In fact, if only the good-quality studies are examined, then an inverse relationship between intensity and efficacy occurs.

It is clear that an analysis such as this is not without difficulty. Confounds exist between intensity and other intervention, child, and family variables. However, the support for the intensity variable provided by the reviews presented earlier is not confirmed by this analysis. This lack of confirmation between sources further emphasizes the need for experimental studies of intensity as an intervention variable.

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[1] *Special thanks to Matt Taylor who assisted in developing this table.*

Table II.1

Effect Sizes Based on Hours Per Week of Intervention for Studies Examining Handicapped, Disadvantaged, and At-Risk Populations Presented by Quality[a] of Study

Hours Per week	Good		Fair		Poor		Total	
HANDICAPPED								
< 2	.78	(4[2])*	1.34	(1[1])	1.17	(11[4])	1.08	(16[7])
2 - 4.9	---*	---	.89	(16[2])	1.03	(31[7])	.98	(47[7])
5 - 9.9	---	---	---	---	.53	(15[5])	.53	(15[5])
10 - 12.9	---	---	1.19	(4[2])	.71	(11[9])	.83	(15[10])
13 - 19.9	.84	(6[2])	.30	(5[2])	.44	(22[4])	.49	(33[8])
20 - 39.9	.52	(2[1])	.70	(4[1])	.86	(5[3])	.74	(1[5])
≥ 40	---	---	---	---	---	---	---	---
DISADVANTAGED								
< 2	.54	(7[3])	.33	(34[6])	.50	(44[9])	.43	(85[12])
2 - 4.9	.40	(19[2])	.64	(21[6])	.68	(20[7])	.58	(60[10])
5 - 9.9	.33	(37[9])	.28	(32[9])	.98	(16[6])	.44	(85[16])
10 - 12.9	.57	(14[4])	.37	(21[8])	1.13	(82[13])	.92	(117[19])
13 - 19.9	.03	(6[2])	.69	(55[6])	.59	(43[9])	.61	(104[13])
20 - 39.9	.46	(45[8])	.49	(40[5])	.30	(33[8])	.42	(118[15])
≥ 40	.37	(17[1])	.71	(12[3])	.79	(8[3])	.57	(37[4])
MEDICALLY AT-RISK								
< 2	.81	(3[1])	.62	(10[2])	1.01	(2[1])	.71	(15[4])
2 - 4.9	.90	(8[4])	.55	(5[2])	---	---	.77	(13[5])
5 - 9.9	-.28	(7[4])	.47	(1[1])	.27	(1[1])	-.13	(9[6])
10 - 12.9	.45	(2[2])	---	---	---	---	.45	(2[2])
13 - 19.9	-.27	(2[1])	---	---	---	---	-.27	(2[1])
29 - 39.9	.08	(6[1])	---	---	---	---	.08	(6[1])
≥ 40	.47	(5[4])	-.04	(1[1])	1.17	(1[1])	.50	(7[5])

[a] Quality is based on threats to internal validity. See Casto and White (1985) for more detail on coding procedures.

* For parentheses: (# of effect sizes [# of studies])

* "___" indicates no data available

EXPERIMENTAL STUDIES COMPARING INTENSITY DIFFERENCES

Another method to examine intensity as an early intervention program variable is through studies that have experimentally compared programs of different intensity. In other words, within the same study, some children were in a group which received more intense intervention services, and others were in a group that received less intensive intervention services. These studies can be categorized as to whether the intensity of intervention services is the only variable being experimentally manipulated (a direct comparison), or whether intensity is one of several variables (e.g., age at start, type of curriculum) being experimentally manipulated (an indirect comparison). Analyses of comparative experimental studies provide the best information regarding a phenomenon under investigation.

For the purpose of this review, all studies in the EIRI research article data base, as of 1989, that experimentally manipulated intensity as an independent variable were obtained. Intensity was defined as an amount of intervention (e.g., hours) provided over a given time frame (e.g., week, month, year, etc.). Studies that compared two different intervention approaches (e.g., Curriculum A vs. Curriculum B) of equal intensity were excluded from the review.

Tables II.2 and II.3 summarize all of the studies examining the intensity of intervention variables that were located. Table II.2 presented studies completed on disadvantaged populations, while Table II.3 presents studies completed on handicapped populations. The tables present information on type of comparison (direct or indirect), reference, a brief description of the comparison (many of the studies also compared intervention/no intervention, but these results are not presented), the quality of the study (poor, fair, or good) based on threats to internal validity, the outcome measures used, and effect size information.

Only nine articles were identified, a very small number of studies given the possible impact of intensity on factors such as child and family functioning, professional training, and costs (Barnett & Pezzino, 1987). Table II.2 presents

Table II.2

Studies Which Have Examined Whether Intensity of Intervention Is Related to Magnitude of Effect for Disadvantaged Children

Type of Comparison	Reference	Description of the Comparison	Study Quality	Type of Outcome Measured	# of ESs	Average ES
Direct	Blank & Solomon (1968)	Preschool plus tutoring five times per week (15 to 20 minutes per session) vs. three times per week.	Fair	Stanford-Binet	1	.72
Direct	Burkett (1982)	Home visits every week vs every two weeks	Poor	PSI; PPVT	2	.05
Indirect	Carter (1978)	Center-based preschool 4 hours per week + 1 hour per week home visits vs. home visits for 1 hour 2 times per week.	Fair	Bayley Mental, Motor; Vineland Social Maturity Scale; Caldwell HOME	4	-.23
Indirect	Dusewicz & Higgins (1971)	Center-based academic preschool for 20 hours per week vs. home visits for 1.2 hours per week.	Fair	Slosson Intelligence Test, PPVT, Vineland Social Maturity Scale	3	.34
Direct	Powell & Grantham-McGregor (1989)	Home visits delivered bi-weekly or monthly (study 1)	Fair	Griffiths Mental Developmental Scales (hearing and speech, hand and eye coordination, and performance subtests combined)	1	.62

Table II.3

Studies Which Have Examined Whether Intensity of Intervention Is Related to Magnitude of Effect for Children with Handicaps

Type of Comparison	Reference	Description of the Comparison	Study Quality	Type of Outcome Measured	# of ESs	Average ES
Direct	Barnett & Pezzino (1987)	Full-day preschool program vs. half-day preschool program	Good	CAPER (expressive language and cognition subtests)	2	-.11
Indirect	Jago et al. (1984)	Total communication preschool curriculum (7 hours per week) plus parent training and 50% parent classroom participation vs. approximately 4 hours per week in a preschool setting.	Poor	Gesell Developmental Scales, REEL, and SICD (Receptive and Expressive)	3	.14
Direct	Sandow et al. (1981)	Parent training via home visits every 2 weeks vs. home visits every 2 months	Good	Cattelle	1 (immediate) 1 (follow-up)	.22 .06
Direct	Taylor et al. (1984)	Full-day preschool program vs. half-day preschool program.	Good	CAPER (expressive language and cognitive subtests)	2	.10

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equivocal results in regard to intensity. The two indirect comparisons which compared center-based vs home-visit intervention programs found mixed results (Carter, 1977; Dusewicz & Higgins, 1971); one study suggesting less intensive home visiting is better, the other suggesting that more intensive center-based intervention is better. The two studies directly examining home visiting also do not allow a clear statement to be made (Burkett, 1982; Powell & Grantham-McGregor, 1989). Burkett's results indicate no difference between weekly and bi-weekly visits. However, the results of Powell and Grantham-McGregor indicate that bi-weekly is more effective than monthly. Taken together, these studies produce equivocal findings. It is important to note that none of these studies are particularly well designed from a methodological perspective.

The studies presented in Table II.3 presented a much clearer picture--but it is a picture which is contrary to the prevailing notion that more intensive interventions are more effective. These studies suggest that more intense interventions for children with handicaps are not related to magnitude of effect.

Overall, the studies reviewed in Tables II.2 and II.3 present no data that suggest more intense interventions are preferred for either disadvantaged or handicapped populations. Difficulties are encountered in the methodological quality of studies and in potential confounds within studies. Consequently, these findings should not serve as the definitive statement on intervention intensity. These findings do make clear the need for high-quality studies that examine the question of intervention intensity. Also, the majority of effects are based only on child outcome measures. It seems plausible that interventions of different intensity may differentially impact on parents and families (Bronfenbrenner, 1979; Dunst, 1986). Impacts on these variables also requires consideration in research studies.

CONFOUNDS AND CONSIDERATIONS

The study of intensity, as with other program aspects, is one that can be affected by confounds. Possible confounds include: (1) Children may start programs at different ages; (2) children may exhibit different levels of delay or different patterns of delay; (3) curricula or duration of intensity may differ between interventions; and (4) families may be from different SES levels or from areas of different population density. All of these factors and others could affect intensity outcomes. Many of these issues cut across research studies and have been addressed elsewhere (Dunst et al., 1989; Simeonsson, 1985). In relation to intensity, however, the treatment verification variable needs to be carefully considered. If weekly and bi-weekly home visits are being compared, then it becomes imperative that information on number of home visits attended be given. For example, if attendance at weekly visits was 40%, and attendance at bi-weekly visits was 80%, then no intensity comparison actually exists.

In addition, a factor related to treatment verification is information on what occurs during home visits or during a "day" at the center. Taylor et al. (1984) discuss their concern that the half-day program they examined may have been as "intense" as the full-day program based on activities that occurred during the "day." Ecobehavioral research on classroom variables has demonstrated that a longer day does not necessarily result in more child-engaged time (Carta et al., 1988); child engaged time being directly related to child gains (Greenwood, Delquadri, & Hall, 1984; Innocenti, 1990). To clearly understand intensity as a program variable, research will need to incorporate measures that examine these process variables (Carta et al., 1988).

Finally, an area that receives criticism in intensity research is the use of different curricula by the programs being compared. This is a confound, but it is a necessary confound in some kinds of intensity research. It would be impossible and inappropriate from an intervention perspective to use the same curriculum if a one-day-per-week home visit was being compared to five-days-per-week center-based program. Individual research must examine the appropriateness of different types of curricula based on the intensities of programs being compared and on the goals of these programs.

It is clear that research on intensity as a program variable (or any program variable) must progress from a multi-tiered parametric approach. Only through such an approach will questions of what works best for whom be answered.

SUMMARY AND CONCLUSIONS

The question of whether existing research has established that more intense interventions result in more positive outcomes was addressed by examining reviews of the literature, by conducting a meta-analysis based on intensity, and by reviewing experimental studies that addressed questions of program intensity. These combined sources suggest that there is currently little evidence to support the position that more intensive programs result in better outcomes. However, methodologically sound research examining this issue is almost nonexistent, and minimal information regarding effects of program intensity on parents and families is available. Some limited cross-study evidence suggests that intensity may be an important variable for center-based programs for disadvantaged infants until they reach age 3 (Bryant & Ramey, 1987; Dunst et al., 1989).

It is disconcerting that so few data are available to address the question of program intensity. Intensity is one of the primary factors affecting intervention costs, and information regarding effective intensities for different disabilities could significantly impact who gets service given available monies (Barnett, 1988). Additionally, clearer knowledge regarding intensity factors should impact on training early interventionists such that Individual Family Service Plans (IFSPs) and Individual Education Plans (IEPs) accurately reflect the needs of children and families (cf., Shonkoff et al., 1990).

In the remainder of this section, the results of seven studies are presented which address some aspect of the issue of whether more intensive intervention programs have benefits for participating children or parents.

JORDAN SCHOOL DISTRICT

Project #1

COMPARISON: Mildly to Severely Handicapped Children--Participation in a 3-day-per-week, center-based preschool program versus participation in an enhanced 5-day-per-week, center-based preschool program.

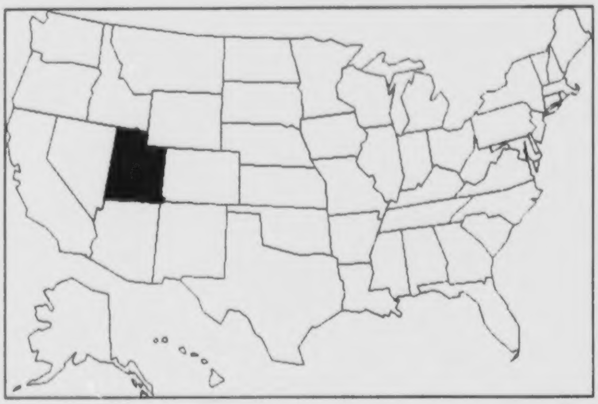
SITE COORDINATOR: Chris Giacovelli, Early Intervention Program Coordinator, Jordan School District

EIRI COORDINATORS: Mark Innocenti and Linda Goetze

LOCATION: Midvale, Utah

DATE OF REPORT: 4-5-1991

Rationale for the Study



Limited evidence exists in the early intervention literature to guide program decisions concerning the relative effectiveness of various intensities of program efforts (Casto & Mastropieri, 1986; White & Casto, 1985). The frequency and intensity of services in early intervention programs varies widely, based on factors such as philosophical orientation and professional judgement of child needs. With the passage of the federal mandate to provide services to all preschool-aged children with disabilities (P.L. 99-457), the intensities of programs may change to reflect the effect of more children in programs and related funding and personnel issues. One result may be that programs will decrease their intensity in an attempt to serve more children with the same level of funding. Conversely, this legislation may increase the number of individuals who advocate in favor of increased intervention for young children with disabilities. This could generate support for more assistance to such children that includes greater program intensity.

Decisions that can potentially affect the lives of children and their families, such as the intensity of a program, must be made using a data base of the effects and costs of programs of varying intensity rather than be made according to bureaucratic needs or well-meant lobbying efforts. This study will help provide information for this data base by comparing two common intensity levels of intervention services for preschool-aged children with disabilities.

Review of Related Research

Although treatment intensity may be an important variable for early intervention programs, little systematic research has occurred in regard to intensity (Bailey & Bricker, 1984; Casto & Mastropieri, 1986; White & Casto, 1985). The field of early intervention commonly holds the belief that more is better (Casto & Mastropieri, 1986). This belief is common to our culture in many areas and may not be valid in all cases (e.g., the megavitamin controversy; Perils of, 1987; Vitamins, 1986).

Table 1.1 summarizes characteristics of five previous studies that directly examined the question of intensity in early intervention (Blank & Solomon, 1968; Burkett, 1982; Jago et al., 1984; Levenstien, 1970; Sandow et al., 1981). Only two of these used children with disabilities as subjects (Jago et al., 1984; Sandow et al., 1981). Three of these studies have comparison groups confounded by different interventions (Blank & Soloman, 1968; Levenstein, 1970; Jago et al., 1984). Sandow had the highest level of methodological rigor of the studies presented, while the other four studies were rated as fair or poor on study quality.

The results of these studies are equivocal. Sandow et al. (1981) found children with disabilities made better progress if home visits were separated by 8-week intervals rather than 2-week intervals. Burkett (1982) reported no differences between children who received home visits once or twice per week. Jago et al. (1984)

Table 1.1

Studies Which Examined Intensity of Early Intervention

Reference	Population	Description of the Comparison	Study Quality	Type of Outcome Measured	Number of ESs	Average ES
Blank & Solomon (1968)	Disadvantaged	Preschool plus tutoring five times per week (15 to 20 minutes per session) vs. three times per week. Confound: Age at start differs between the two groups.	Fair	Stanford-Binet	1	.72
Burkett (1982)	Disadvantaged	Preschool plus home visits every week vs. every 2 weeks (142 vs. 71 total hours).	Poor	PSI, PPVT	2	.05
Jago et al. (1984)	Disabled	Total communication preschool curriculum (7 hours per week) plus parent training and 50% parent classroom participation vs. approximately 2 hours of signing per week in a preschool setting plus equally brief parent training (189 vs. 52 total hours) Confound: Each group used a different curriculum.	Poor	Gesell Dev. Scales REEL, & SICD (Receptive and Expressive)	3	.14
Levenstein (1970)	Disadvantaged	Two year (age 2 at start) home-based treatment program of modeling verbal interaction between mother and child vs. a one-year (age 3 at start) treatment. Confound: Age at start differs between the two groups.	Fair	Stanford-Binet; WISC; WRAT (math/reading)	2 (immediate) 5 (follow-up)	.57 .31
Sandow et al. (1981)	Disabled	Parent training via home visits every 2 weeks vs. home visits every 2 months (191 vs. 44 total hours)	Good	Cattelle	1 (immediate) 2 (follow-up)	.22 .06

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studied language development and compared seven hours per week of intervention versus four hours and one hour per week. More hours of intervention proved better for language development, but these results are confounded by different intervention approaches in each of the three intensities. The finding from these intensity studies makes clear the need for new research studies which are methodologically sound, which directly address the question of program intensity, and which systematically vary intensity parameters.

The need for methodologically sound studies directly examining intensity parameters, where comparison groups are not confounded by different interventions, is further stressed by analyses conducted by EIRI. All articles on early intervention compiled by EIRI for use in various meta-analyses were examined for factors related to intensity. These factors were: total hours of intervention, hours per week of intervention, and duration of intervention in weeks. All studies from which these factors could be gleaned were taken, rated according to methodological quality (based on threats to internal validity), and effect sizes were obtained from the results presented. Intensity factors were not under examination (i.e., an independent variable) in the majority of this research, but information was presented that allowed intensity information to be obtained. These data are presented in Table 1.2. Only findings from studies that used children with disabilities as subjects are presented. Data in this table do not support the suggestion that "more is better."

This study directly examined one aspect of the question of program intensity. A comparison of a 3-day versus a 5-day-per-week early intervention preschool program may be of particular importance, as both represent common program intensities, and study results could affect personnel and funding issues. Impact of these different program intensities on parents and families, as well as their child, was also examined. The effects of intervention on parent and family functioning have not received sufficient investigation in previous early intervention research (Casto &

Table 1.2

Average Effect Size for Different Intensity Factors From Studies Examining Early Intervention on Children with Handicaps

	Quality of Studies*			
	Good	Fair	Poor	Total
Total Hours of Intervention				
< 50	.78 (4 [2])+	1.01 (12 [3])	.89 (18 [6])	.92 (34 [10])
50 - 249	....^	.08 (3 [1])	1.20 (19 [5])	1.05 (22 [6])
250 - 499	....	.54 (5 [2])	.65 (13 [8])	.62 (18 [8])
500 - 749	.66 (2 [1])	3.31 (1 [1])	.41 (21 [4])	.54 (24 [6])
750 - 999	....	....	1.16 (5 [3])	1.16 (5 [3])
1000 - 1999	.52 (2 [1])	.66 (8 [2])	.59 (7 [3])	.62 (17 [5])
≥ 2000	....	.69 (2 [1])	1.32 (6 [2])	1.16 (8 [2])
Hours of Intervention Per Week				
< 2	.78 (4 [2])	1.34 (1 [1])	1.17 (11 [4])	1.08 (16 [7])
2 - 4.9	....	.89 (16 [2])	1.03 (31 [7])	.98 (47 [7])
5 - 9.9	....	....	.53 (15 [5])	.53 (15 [5])
10 - 12.9	....	1.19 (4 [2])	.71 (11 [9])	.83 (15 [10])
13 - 19.9	.84 (6 [2])	.30 (5 [2])	.44 (22 [4])	.49 (33 [8])
20 - 39.9	.52 (2 [2])	.70 (4 [1])	.86 (5 [3])	.74 (11 [5])
≥ 40	....	....	....	....
Duration of Intervention (Weeks)				
≤ 12	.39 (8 [3])	1.44 (7 [3])	.83 (25 [10])	.85 (40 [15])
13 - 25	.13 (2 [1])	.55 (28 [4])	.83 (41 [15])	.70 (71 [19])
26 - 38	....	.57 (23 [8])	.71 (81 [27])	.68 (104 [33])
39 - 51	.65 (11 [2])	.70 (8 [2])	.96 (40 [23])	.87 (59 [26])
52 - 77	....	.64 (8 [3])	1.00 (24 [11])	.91 (32 [14])
78 - 103	....	.69 (2 [1])	.90 (13 [6])	.87 (15 [6])
≥ 104	.10 (6 [1])	.01 (7 [1])	.49 (11 [4])	.26 (24 [5])

NOTES: * Based on threats to internal validity

+ (# of Effect Sizes [# of studies])

^ No data for cell

Mastropieri, 1986; Dunst, 1986). Impacts on family functioning may translate into immediate and long-term changes that can, positively or negatively, affect the child (Bronfenbrenner, 1979; Dunst, 1986).

Overview of Study

Intensity has many dimensions (e.g., programs may vary hours per day of interventions, days per week of intervention, degree of engaged learning time in which child are involved, etc.). This study contrasted preschool intervention services for two groups distinguished by multiple variations. First, children in one group received 5-days-per-week, 2-hours-per-day preschool intervention services in classrooms established to provide appropriate, child-centered services for children with disabilities (more intensive group). Children in the other group received 3-days-per-week, 2-hours-per-day preschool intervention services in the same classroom format (less intensive group). The more intensive condition in this study also had a 3:1 child/teacher ratio, while a 5:1 child/teacher ratio existed for the less intensive condition classrooms. A third dimension along which intensity was different was that more intensive condition classrooms were provided with increased availability of communication and motor therapists. In practice, this increased therapy time resulted in the presence of a speech and language therapist in more intensive condition classrooms each day they were in session, while the speech and language therapists were available on an every-other-day basis for the less intensive classroom condition. Differences in program efficacy were evaluated by assessing child and family outcomes, and by obtaining cost data.

Method

This study was conducted in conjunction with the early intervention program of the Jordan School District. The Jordan School District has a history of active involvement in early intervention. Although prior to the 1987-88 academic year, early intervention services had been funded by the Utah Division of Social Service, the intervention services were housed in a school in the Jordan District. With the passage of P.L. 99-457 and State of Utah mandates, the district has taken over the financial and administrative responsibility of early intervention for preschoolers with disabilities This has resulted in the district expanding early intervention classrooms into neighborhood schools while retaining experienced staff. The Jordan District currently maintains early intervention rooms at three schools. The district offers a variety of intervention options ranging from home intervention, to various classroom mainstream options, to placement in neighborhood daycare centers.

The early intervention program previously provided 5-days-per-week, 2½ hours-per-day, classroom-based intervention services to a limited number of qualified children. Children who met both age and Utah State Office of Education developmental criteria, as explained in the Recruitment section below, were placed on a waiting list, and classroom slots were filled on a first-come basis. With the transition of preschool services to school district control, the school district began serving all eligible preschoolers and providing transportation. These factors resulted in a change in the service structure of the preschool program to a 3-days-per-week, 2-hours-per-day program.

This change in program intensity raised concerns from preschool providers, school administrators, and parents of children with disabilities. In conjunction with Early Intervention Research Institute (EIRI) support, the Jordan School District received research funds from the Utah State Office of Education to examine the question of program intensity. The specific comparison investigated was established through negotiations with all participating agencies.

Subjects. Subjects for this study came from four classrooms located at two schools (two classrooms/school). All subjects were recruited for this study at the beginning of the 1988-89 school year. Fifty-three children (28 less intensive, 25 more intensive) between 36 and 62 months of age (mean = 50 months) participated in the study. Sixteen children in the less intensive group were male, and 8 males were in the more intensive group. The age equivalent for the children, based on the total score of the Battelle Developmental Inventory (BDI), ranged from 16 to 46 months (mean = 30 months). The majority of children were mild to moderately disabled. Using a developmental quotient (DQ) calculated by dividing the BDI total age equivalent by chronological age and then multiplying by 100, 65% of children had DQs of 65 or below; no child had a DQ lower than 40.

Recruitment. The criteria for acceptance into the early intervention program was that adopted by the Utah State Office of Education. This criteria specified that preschool-aged children were eligible for services if they demonstrated a delay from the norm of -1.5 or greater standard deviations in three developmental areas of -2.0 or greater standard deviations in two developmental areas, or -2.5 or greater standard deviation in one developmental area. Multiple assessments and evaluators were used by the school district in determining eligibility.

All parents of children identified as disabled at the schools where the classrooms were located were considered for possible placement in this study. Parents were either verbally informed or sent a letter regarding the study. Parents were then given an informed consent form to read and to indicate their agreement or refusal to participate. The site contact person was available to answer parent questions and concerns. Approximately 5% of parents refused participation. The majority of these refusals were from parents of younger children who desired the less intensive program.

Assignment to groups. During the one-year intervention study period, subjects attended one of two schools, dependent on address. In each school, one of two classrooms was established as a more intensive classroom. Two teachers, one at each school, conducted both a less and more intensive classroom. The time of day services were delivered (morning or afternoon) was counterbalanced across schools.

As children were identified, the site contact sent information about the child (including a rating of degree of disability [mild, moderate, severe] based on the initial district assessment) to the EIRI research coordinator. This information was used to place each child in a school by severity matrix (2 x 3). For subjects in each cell, there were four possible sequences of assignment (ABAB, ABBA, and BAAB, where A = the more intense group and B = the less intense group). A die was cast to determine the assignment sequence for each set of 4 children in each cell. This process was repeated for each cell of the matrix as the first child in a cell was identified.

Attrition. Fifty-three subjects were recruited to participate in this study at the beginning of the 1988-89 school year. To date, none of the subjects have been lost to the study. Posttest data for two follow-up years were obtained for all 53 subjects and their parents.

Demographic characteristics. The subject pool for this study is complete. Funds provided by the Utah State Office of Education were for only a single year. The demographic characteristics of the population sample in this study approaches what many consider the "typical" American family (see Table 1.3). Parents had slightly more than a high school education and were in their early 30s. In 92% of the families, the parents of the child were married and living together, and the mother was the primary provider of child care (96%); families had an average of four children, including the child with disabilities. Fathers worked a 40-hour week in either blue collar or technical/managerial positions; mothers did not work or held part-time jobs. The average family income was $30,000. All the families spoke English as their primary language, and the majority (94%) were Caucasian.

Demographic differences between the less and more intensive subjects can be evaluated using the p-values and effect sizes given in Table 1.3. Statistically significant differences ($p < .10$) existed for percent male subjects, years of education for the mother, hours per week mother was employed, and number of siblings. The more intensive subjects had more educated mothers who worked more each week than the less intensive subjects. The more intensive group also had a higher percent of children in daycare than the less intensive group. The number of siblings in families receiving the less intensive treatment was higher than in the more intensive intervention families.

Table 1.3

Comparison of Groups on Demographic Characteristics for Jordan Intensity Study

Variable	Less Intensive			More Intensive				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[§]
• Age of child in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Age of mother in years at pretest[+]	32.5	4.5	28	32.6	6.6	24	.95	.02
• Age of father in years at pretest[+]	35.0	4.2	28	34.9	6.0	24	.68	.02
• Percent male[*][+]	43		28	68		25	.07	.51
• Years of education for mother	12.7	1.9	28	14.2	1.9	25	.006	.79
• Years of education for father	13.8	1.8	26	14.3	2.5	24	.37	.28
• Percent with both parents living at home	100		28	84		25	.25	.32
• Percent of children who are Caucasian[*]	96		28	92		24	.47	.20
• Hours per week mother employed[+]	8.3	14.8	28	17.0	20.4	25	.08	.59
• Hours per week father employed[+]	42.3	17.9	28	38.6	16.6	22	45	.21
• Percent of mothers employed as technical managerial or above[*]	7.0		28	21.0		24	.16	.40
• Percent of fathers employed as technical managerial or above[*]	36.0		28	12.2		23	.25	.33
• Total household income	$26,821	$8,572	28	$34,380	$23,512	25	.11	.88
• Percent with mother as primary caregiver[*]	100		26	92		26	.50	.19
• Percent of families using daycare on a daily basis[*][+]	32		28	48		25	.25	.32
• Number of siblings[+]	3.1	1.9	28	2.0	1.5	25	.02	.58
• Percent with English as primary language	100		28	100		25	1.0	.00

NOTES: [*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[+] Absolute values of the ES are reported

[§] $ES = \dfrac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{SD\text{ (less)}}$

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All of these characteristics on which demographic differences were found are complementary. More educated mothers could be expected to work more as their earnings in jobs outside the home would, on average, be higher. Families with two parents who work also could be expected to have a higher mean income than families where only the father is employed. Families where the mother is employed outside the home more hours use daycare more than families where the mother works only in the home or fewer hours outside the home. Finally, the number of siblings is higher for the less intensive group who use daycare less and have relatively less educated mothers. It has been shown that, on average, more educated parents tend to have fewer children. More siblings raises the cost of using daycare and lowers the benefits from the mother working outside the home. Logically, these differences between the demographic characteristics of the more and less intensive subjects and their families are interconnected.

The results of the analysis of pretest differences on 17 demographic variables indicate differences between the groups as the intervention began. In some cases, these differences favor the more intensive group and in others the less intensive group. For example, the more intensive group has better educated mothers and higher incomes, but the less intensive group has a higher percentage of both parents living at home and a higher percentage of fathers employed as technical/managerial level or above. In most cases, the differences were quite small. If there is any bias in the random assignment, it would slightly favor the more intensive group. Analysis of covariance, utilizing those variables for which pretest differences were significant, was used to adjust for biases that may exist through random assignment.

Intervention Programs

The early intervention program of the Jordan School District was mandated to provide services to all children with disabilities, ages 3 to 5 years, who resided within district boundaries. The majority of these children were served in two district schools that also served as elementary schools for children without disabilities. Other service options were possible (home services, self-contained school placement, services in a daycare center) and were dictated by child needs. To study the program intensity question, classrooms within the two most populous schools within the district were selected for research involvement. Children in both the less and more intensive programs were located at each school.

Where the question of importance in this study was program intensity, it was critical that other intervention factors be held as constant as possible. At each school, teachers had morning and afternoon sessions. Two teachers were involved in this study (one per school), and each taught a less and more intensive classroom. At one school, the less intensive class was a morning class, at the other an afternoon class. This arrangement helped control for differences resulting from factors other than intensity.

One difference in the two schools was that one of the schools (one less and one more intensive condition classroom) utilized a reverse mainstreaming arrangement to provide services. In this school, regardless of condition, the classrooms were composed of 50% children without disabilities three days per week. The classrooms at the other school, although not similarly mainstreamed, attempted to provide integrated services with children in the kindergarten and first grade classrooms at that school. The frequency and nature of these contacts varied considerably at this school.

Children were initially assessed for early intervention placement by a transdisciplinary team of professionals using norm-referenced assessment instruments. These assessment protocols were then forwarded to the teacher for eligible children; receipt of further assessment for speech/language or motor therapy was based on this evaluation.

Once enrolled in the program, the child received a criterion-referenced assessment by the teacher. If determined appropriate at evaluation, or if suggested by the teacher, the therapists working with that teacher and classroom provided further specific assessments. Information from all these sources was then combined at a meeting, in which the parent participated, to develop an Individual Education Plan (IEP) for the child. The IEP then dictated the specific nature of intervention services for that child.

Each classroom consisted of approximately 15 children. The majority of these children were in this study, but children who were not participating in the intensity comparison could also have been in one of the less intensive classrooms. Each classroom was staffed by one certified teacher who had access to paraprofessional aides, communication therapists, physical and occupational therapists, and a behavior specialist. Access to aides and communication therapists varied by condition as described below. Child need (as per the IEP) dictated access to motor therapists and the behavior specialists, and this was equally distributed across conditions.

Teachers were free to select curricula of their choice, and classroom activities were drawn from different curricula. The primary curriculum for all classrooms can be described as a theme-based, developmentally appropriate one focused on teaching skills embedded in the daily activities. Both the teachers and communication therapists used this approach which focused on naturalistic teaching (c.f., Haring & Innocenti, 1989).

The daily organization of the classrooms was similar, regardless of experimental condition. The teacher established a number of activities that the children alternated through during the day. These activities were either directed by the aides or the teacher. Children rotated through these activities in small groups. Generally, teachers selected a number of themes that were emphasized during a school week. For example, the color green, the shape of a square, and the concept under were weekly themes. Large group activities, such as singing and calendar, were scheduled between other activities. Children were provided a snack activity each day. Children in need of more individualized instruction, as dictated by child need, were pulled from other activities for individual or smaller (2-3 children) group instruction. Individualized instructional activities were usually conducted by the teacher.

Evaluation of child IEP objectives was built into the IEP. Data on objectives were collected daily, weekly, monthly, or bi-annually, dependent on the objective. Specific criteria were set for each objective to guide evaluative activities.

Less intensive intervention program. This program consisted of a 3-days-per-week, 2-hours-per-day intervention service. The teacher:child ratio in the classroom was 1:5, resulting in each classroom being staffed by a teacher and two paraprofessional aides. Communication therapy was provided primarily through a consultation model where classroom staff took primary responsibility for goals and implemented activities as appropriate throughout the school day. The communication therapist was in the classroom approximately every other school day. Some children received individualized therapy from the therapist on these days. In contrast to the more intensive intervention program, there was no group communication therapy activity conducted in the less intensive intervention program.

More intensive intervention program. Children in this group received 5-days-per-week, 2-hours-per-day intervention services. The teacher:child ratio in this class was enhanced from the standard program and consisted of a 1:3 ratio; one teacher and four paraprofessional aides per classroom. Communication therapy was delivered primarily through a consultation model, but the therapist was allowed more time to work with teachers. The communication therapist was in these classrooms every school day. The communication therapist, in addition to consultation and individual therapy, conducted a large group communication activity and conducted snack-time activities such that naturalistic language teaching interventions were included. Communication therapy occurred more often for the more intensive group and the large group activity was undertaken only in the more intensive group.

Treatment Verification

A number of procedures were implemented to verify that the interventions were being implemented as intended. Table 1.4 presents some of these data. One method to verify that treatment was received was through child attendance data. Attendance problems in an intensity study could significantly affect research conclusions. Daily attendance records were kept by teachers, and these were forwarded to EIRI monthly. Regular attendance by subjects in both intensity groups is indicated.

Table 1.4
Treatment Verification data for Jordan Intensity Study

	Less Intensive			More Intensive				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[~]
• General health of child[&]	2.0	0.6	28	2.0	0.6	23	.64	.00
• Percent child attendance	90.0	9.1	28	92.5	5.5	25	.22	.27
• Parent satisfaction[♣]	23.1	4.5	28	24.8	2.9	23	.11	.38
Staff working with child	3.8	0.5	28	3.8	0.4	24	1.0	0
Ability to communicate w/staff	3.2	0.8	28	3.5	0.6	24	.17	
Program goals/activities for child	3.5	0.6	28	3.6	0.6	24	.35	
Participation in child's program	3.0	0.9	28	3.3	0.8	24	.31	
Services available for child	3.2	0.9	28	3.5	0.6	23	.17	
Child's progress	3.2	0.9	28	3.7	0.6	24	.04	
Child's program	3.3	0.8	28	3.6	0.6	24	.05	
• Teacher rating of parents[*]	6.5	1.9	28	6.8	1.8	25	.61	.16
• Service hours received outside school program								
• Percent of children who received outside speech therapy	30.0		20	25.0		12	.77	
• Percent of children who received outside motor therapy	27.8		18	16.7		12	.50	

[&] Based on a parent rating of child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[♣] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program. Each question is scored from 1 to 4. Higher scores indicate greater satisfaction.

[*] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[•] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

[~] $$ES = \frac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{SD\text{ (less)}}$$

In addition to attendance, health data regarding the child was important. If the child was attending but in poor health, results may be compromised. Parents completed a health questionnaire at Posttests #1 and #2. Questions regarding a variety of health issues were asked. No differences between groups were found on any of these health measures for Posttest #1. General health data are presented in Table 1.3. Posttest #2 results are being evaluated.

In a study such as this, it is possible that the parents of children in the less intensive group were supplementing their child's education with private therapies or instruction. Questions were asked at Posttest #1 and #2 to examine this issue, and parents reported involvement in these supplemental activities. Supplemental hours of speech therapy, motor therapy, and daycare are reported in Table 1.3. No significant differences were found on the supplemental activities for Posttest #1.

Other areas also relate to treatment verification. To determine if teachers of children during the one year intervention perceived differences in the skill levels of parents, they were asked to rate each parent regarding parent support of their child, knowledge of the intervention process and their child's development, and attendance at required activities. No differences were found between the parents in the two groups on any of these measures.

Teachers and other support staff were also evaluated by their supervisor (the site contact) regarding their teaching techniques. An evaluation criteria developed by EIRI was used. Teachers and communication therapists at both schools were rated as being in the upper 25% of professionals with whom their supervisor had worked. The respective ratings, based on a 30-point scale, of the teacher and communication therapist were: 30 and 30 for one school; 24 and 28 at the other school.

Another aspect of treatment verification was parent satisfaction with the program. Parent satisfaction was assessed through a seven-question scale completed at posttest. The results of this questionnaire are presented in Table 1.3. No group differences were found except on those questions assessing satisfaction with child progress and the general program. Parents in the more intensive group were more satisfied with both the progress their child had made and the program in general. It should be noted that average parent satisfaction in all areas addressed represents high levels of satisfaction. Differences occur within a narrow boundary of positive satisfaction.

Site review. A major source of treatment verification information was a site review conducted by the site coordinator. The purposes of this review were to (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance. Purpose (a) and (b) were relevant to treatment verification.

A site review was conducted on April 11, 1989. The site review was conducted by a team consisting of: (a) the Jordan site coordinator; (b) the site contact, Chris Giacovelli; (c) John Killoran, Preschool Specialist for the Utah State Office of Education; and (d) Jeannette Misaka, Professor of Special Education at the University of Utah. The site review was structured by the EIRI developed Treatment Verification Guide. (A copy of the site review report and treatment verification guide can be obtained from EIRI.)

Site review findings indicated that the Jordan School District Early Intervention Program was delivering appropriate, quality intervention services. Variables that distinguished different intensities of programs were being fully implemented. The less and more intensive classrooms were clearly distinct with respect to student: teacher ratios, number of days per week the intervention occurred, and frequency of speech and language therapy. Staff of the Jordan Preschool were qualified, enthusiastic professionals whose goal was to provide quality services to preschool-aged children with disabilities. Teachers were commended on use of developmentally appropriate classroom activities and naturalistic teaching strategies. The program was competently administered and had in place a well-developed procedures manual. The program-developed transition procedures for information transfer were excellent. Minor suggestions for improvement were made regarding: daily lesson plans, data collection, IEP development, assessment for program entrance, and training for aides. No threats to the validity of the research study were found.

Ecobehavioral assessment. A final major source of treatment verification was the assessment of the ecobehavioral differences between classrooms. A concern with this intervention was whether classroom contexts and teacher behaviors varied for classrooms of different intensity. It is possible that time differences (hours/week) may not result in actual program intensity differences. For example, Carta et al. (1988) examined preschool programs and found two that operated for different lengths of time, but where the intensity was equivalent. To account for possibilities such as this, and to examine program differences that are related to intensity, an ecobehavioral observation instrument was used. Ecobehavioral observation assesses program variables through systematic observation and measures moment-to-moment effects of the interaction between environment (classroom contexts), teacher behavior, and student behavior (c.f., Carta et al., 1988). The Ecobehavioral System for Complex Assessment of the Preschool Environment (ESCAPE; Carta, Greenwood, & Atwater, 1986) was used for this observational assessment.

The ESCAPE was designed for use in preschool environments that serve students with disabilities. The ESCAPE assesses three major features of preschool early intervention programs: (1) the program ecology, (2) the behavior of teachers, and (3) the behavior of child participants. These three major categories are subdivided into 12 subcategories (see Table 1.5). All variables are recorded on a 15-second

Table 1.5

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

Ecology Variables

A. Designated Activity

The overall format on structure of the activity in which the teacher has placed the target child.

Snack
Fine Motor
Story
Language Programming
Play
Music/Dance/Recitation
Self-Care
Transition
Clean-up
Gross Motor
Preacademics
Class Business
Time Out

B. Activity Initiator

The person who selected the activity in which the target child was engaged.

Teacher
Child
No one

C. Materials

Objects with which the target child is engaged or attending to

Large Motor Equipment
Manipulatives
Bathroom
Art/Writing
Story Books
None
Instructional
Audio-Visual
Other
Pretend Play Toys
Food or Food Preparation

D. Location

The physical placement of the child

On Floor
In Line
At Table
Undefined
In Chair
On Equipment

E. Grouping

Solitary
Small group
One teacher with one student
Large group

F. Composition

Mix of handicapped and nonhandicapped student within a group.

All handicapped
Majority handicapped
Equal
None
Majority nonhandicapped

Teacher Variables

G Teacher Definition

Primary adult with whom the target child's interacting.

Teacher
Ancillary Staff
Aide
Substitute Teacher
Student Teacher
No Staff
Volunteer

H Teacher Behaviors

Physical Assisting
Prompting
Gesturing/Signing
Verbal Instruction
Approval
Reading Aloud/Singing/Recitation
Disapproval
Discussion
Verbal
No Response

I Teacher Focus

The direction of the behavior of the coded adult

Target child only
Target child and others
No one
Other than target child

Student Variables

J. Target Behaviors

Behaviors that indicate student attention, engagement, and for participation.

Academic Work
Gross Motor Behaviors
Transition
Pretending
Singing/Reciting/Dancing
Attention
None
Manipulating
Self-care

(continued)

Table 1.5 (continued)

ESCAPE Variable and Categories Within Variables for Jordan Intensity Study

K.	Competing Behaviors			
	Competing behaviors are those which are commonly considered to be unacceptable			
	Acting-out	Off-task	Self-stimulation	None
L.	Verbal Behavior			
	Verbal or signed expression			
	Talk to Teacher	Talk to Peer	Undirected	No Talk

momentary time-sampling system where all categories are scored over a one-minute period. Each subcategory is examined and scored within a 15-second time period.

ESCAPE observations were conducted in April, 1989. Each child was observed for three 10-minute samples, distributed across different days and time periods. Observations were conducted on all children in all classrooms. The only exception was one more intensive intervention subject who left school before observations were conducted.

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 25% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same category for a particular variable, averaged 95% across variables, with a range from 86% to 100%.

Results from the ecobehavioral observation are presented in Table 1.6. This table presents mean percentages of time that each variable was observed and analyses conducted on these variables. In addition, engagement variables are presented. Engagement values are determined based on a child's behavior across all student behavior categories during a single interval. Appropriate engagement is hypothesized to be the primary behavior contributing to child development (Carta et al., 1988).

Table 1.6

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

Variable	Less Intensive			More Intensive				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^a
• Designated Activity								
Snack	5.2	10.5	28	6.3	10.4	24	.70	.10
Play	5.1	13.7	28	7.5	11.7	24	.51	.18
Transition	18.9	11.7	28	18.9	13.2	24	1.0	0
Preacademics	22.6	17.5	28	7.3	10.5	24	.00	-.87
Fine Motor	12.9	14.7	28	20.1	22.9	24	.19	.49
Music/Dance/Recitation	6.3	10.2	28	9.2	13.3	24	.39	.28
Clean-up	1.8	3.6	28	2.5	3.8	24	.49	.19
Class Business	13.3	16.1	28	11.9	13.7	24	.74	-.09
Story	3.9	9.6	28	6.1	12.2	24	.47	.23
Self Care	.2	.8	28	1.9	4.4	24	.08	2.13
Gross Motor Programs	9.1	13.2	28	5.3	8.6	24	.21	-.29
Time Out	.5	2.5	28	1.5	6.7	24	.48	.40
Language Programming	.0	--	28	1.3	6.1	24	.01	.72
• Activity Initiator								
Teacher	94.4	12.7	28	92.2	10.3	24	.50	-.17
Child	5.6	12.7	28	7.5	10.1	24	.55	.15
• Materials								
None	31.9	15.9	28	27.8	15.4	24	.36	-.26
Food/Food Preparation Materials	6.5	12.3	28	7.6	11.0	24	.75	.09
Instructional Materials	21.6	18.4	28	5.7	10.2	24	.00	-.86
Manipulatives	7.5	11.5	28	19.8	22.5	24	.02	1.07
Art/Writing Materials	5.0	10.2	28	.7	2.7	24	.04	-.42
Pretend Play Toys	2.6	7.1	28	4.0	7.4	24	.50	.20
Large Motor Equipment	8.4	13.9	28	6.0	10.5	24	.49	-.17
Story Books	3.9	9.6	28	7.3	13.0	24	.29	.35
Other Materials	12.6	15.3	28	17.6	15.0	24	.24	.33
• Location								
At Tables	38.5	27.9	28	41.1	25.9	24	.73	.09
On Floor	17.7	16.5	28	22.0	24.8	24	.48	.26
Undefined Location	7.6	7.9	28	11.8	9.2	24	.08	.53
On Equipment	16.3	27.4	28	6.1	13.7	24	.09	-.37
In Line	1.6	3.4	28	2.8	4.8	24	.32	.35
In Chairs	18.1	20.0	28	14.6	24.1	24	.58	-.18
• Grouping								
Small Group	24.8	26.4	28	38.6	24.7	24	.06	.52
Large Group	71.0	27.1	28	52.8	24.8	24	.02	-.67
1 Teacher w/1 Student	1.5	3.7	28	2.7	8.0	24	.51	.32
Solitary	2.7	5.0	28	4.1	6.0	24	.36	.28
• Composition								
All Handicapped	49.8	46.9	28	75.4	23.6	24	.02	.55
None	4.3	6.0	28	11.3	21.0	24	.13	1.17
Majority Handicapped	10.7	16.1	28	2.6	7.0	24	.02	-.50
Majority Nonhandicapped	29.9	34.0	28	8.7	13.3	24	.00	-.62
Equal	4.5	8.8	28	.5	2.1	24	.43	-.45
• Teacher Definitions								
Aide/Paraprofessional	67.5	26.3	28	61.5	27.2	24	.43	-.23
Teacher	17.6	21.3	28	11.9	19.4	24	.32	-.27
Ancillary Staff	1.0	3.7	28	1.5	6.7	24	.73	.14
Volunteer	10.8	12.7	28	24.2	27.1	24	.03	1.06

(continued)

Table 1.6 (continued)

Percentage of Time in Categories Observed by the ESCAPE for the Jordan Intensity Study

Variable	Less Intensive			More Intensive			p Value	ES[a]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Teacher Behavior								
Physical Assisting	5.8	6.2	28	4.2	4.8	24	.31	-.26
Gesturing/Signing	1.0	2.3	28	.4	1.0	24	.22	-.26
Approval	4.7	4.0	28	2.7	3.0	24	.05	-.50
Disapproval	2.7	3.1	28	4.9	3.6	24	.02	.71
Verbal Prompting	13.5	7.8	28	12.0	6.2	24	.43	-.19
Verbal Instruction	16.9	7.9	28	14.3	7.1	24	.21	-.33
Reading/Aloud/Signing/Reciting	4.9	7.9	28	5.0	5.6	24	.97	.01
Discussion	6.6	5.2	28	4.8	6.1	24	.25	-.35
No Response	43.4	11.5	28	50.1	12.7	24	.05	.58
• Teacher Focus								
No One	43.4	11.5	28	49.4	13.0	24	.08	.52
Other Than Target Child	28.0	8.0	28	23.5	11.5	24	.10	-.56
Target Child and Others	17.5	11.3	28	15.0	8.9	24	.39	-.22
Target Child Only	10.5	7.5	28	10.6	9.5	24	.97	.01
• Target Behaviors								
Academic Work	20.2	16.4	28	6.5	11.2	24	.00	-.84
Pretending	1.8	6.2	28	3.6	6.7	24	.32	.29
Manipulating	12.4	14.2	28	20.5	22.5	24	.13	.57
Gross Motor Behaviors	12.1	16.1	28	8.7	12.3	24	.39	-.21
Sing/Recite/Dance	5.9	9.9	28	8.3	13.2	24	.46	.24
Self-Care Behaviors	3.9	9.6	28	7.9	11.4	24	.17	.42
Transition Behaviors	20.7	10.9	28	19.0	13.0	24	.62	-.16
Attention	23.0	18.3	28	25.1	16.3	24	.66	.11
None	.0		28	.1	.6	24		
• Competing Behaviors								
None	78.2	16.0	28	77.4	14.3	24	.84	-.05
Off-task Behaviors	19.8	14.4	28	18.7	10.7	24	.76	-.08
Self-Stimulation	1.3	2.9	28	1.7	4.6	24	.70	.14
Acting Out Behaviors	.5	1.2	28	.3	.8	24	.33	-.17
• Talk								
No Talk	94.5	6.9	28	91.1	7.8	24	.11	-.49
Talk to Teacher	4.0	6.1	28	3.7	5.2	24	.87	-.05
Undirected Talk	.9	2.2	28	1.8	3.2	24	.25	.41
Talk to Peer	.6	1.3	28	1.5	2.6	24	.17	.69
• Engagement								
Appropriate Engagement	42.2	19.6	28	43.2	18.6	24	.86	.05
Appropriate Not Engaged	30.8	17.3	28	29.3	16.1	24	.76	-.09
Appropriate Engagement w/Other Behavior	24.7	15.8	28	23.9	11.2	24	.84	-.05
Appropriate-Not Engaged w/Other Behavior	2.2	3.8	28	2.9	4.8	24	.54	.18

[a] $ES = \frac{\bar{x}\text{ (more)} - \bar{x}\text{ (less)}}{SD\text{ (less)}}$

These results should be interpreted conservatively. Multiple t-tests were conducted to obtain comparative data and may result in findings of significance, even when the groups are comparable. A difference that emerges is that the less intensive classrooms more often used preacademic activities for instructional purposes. The finding from the designated activity category is supported by results from the materials category, and student target behaviors category.

These findings suggest that some differences between the groups existed in the way that time was spent by the two groups although the differences for most categories were not significant. Examining variables within and across the teacher, location, and materials categories, the groups appear more similar than different. Teachers, overall, responded similarly to children in both groups. In the student behavior categories, the different groups may have been required to perform different target behaviors, although levels of appropriate engagement were similar between the groups. These results suggest that the time of the children in both groups was spent engaged in very similar activities. The major difference between the two groups was that the children in the more intensive classroom engaged in these activities for more days per week than the children in the less intensive group.

The intensity differences are supported by the finding that the subjects in the more intensive group spent significantly more time in small groups, while the less intensive children were in large groups more often. Although the children in both groups were engaged in similar activities during the time spent in groups, the intensity differences were designed to provide a higher teacher:child ratio for the time that subjects were engaged; the data in the grouping category supports that result.

Cost of alternative interventions. The cost analysis for this study was conducted during the 1988-89 school year. Costs are based on those classrooms involved in the study (two less intensive, two more intensive). Cost estimates are based on a class of 15 students. Even though the number of subjects for the study was not 15 per class in all classes, classes were designed for 15 students. Cost data were obtained using the ingredients approach described earlier. As shown in Table 1.7, each alternative used direct service and administrative personnel, occupancy, equipment, transportation, and materials and supplies in varying amounts according to the intensity of program. Cost estimates on Table 1.7 are in 1990 dollars. In addition, undiscounted costs and costs discounted at real rates of 3% and 5% are given.

Table 1.7

Cost Per Child for Jordan Intensity Study

Resources	Less Intensive	More Intensive
1. **UNDISCOUNTED COSTS**		
Agency Resources		
Direct Services	$1,709	$3,570
Administration		
Preschool	623	623
District	35	59
Occupancy	294	502
Equipment	71	119
Transportation		
Children	405	676
Staff	14	22
Materials/Supplies	52	87
TOTAL	***$3,203***	***$5,658***
2. **DISCOUNTED COSTS (3%):**	$3,398	$6,003
3. **DISCOUNTED COSTS (5%):**	$3,531	$6,238

The average cost per child for the less intensive program is divided by the number of days those children received intervention, 117 days, to obtain the average cost per day equal to $25.68 per child. Similarly, the more intensive program, which provided 195 days of intervention per child, cost $27.22 per child per day. Daily costs were roughly equivalent. The difference in average total cost per child between the more and less intensive programs clearly results from the extra days of intervention rather than other cost differences.

The three-day program operated one morning and one afternoon class for two hours per day, three days per week. Direct service personnel included a teacher, a speech and language therapist, a physical therapist, an occupational therapist, and two aides in each class. The five-day program also operated a morning and afternoon session. Classes were held for two hours per day, five days per week. The same staff conducted the five-day intervention with the addition of two aides. Of course, direct service staff reported devoting more of their total FTE to the five-day program. The salaries and benefits for direct service personnel were determined according to their FTE devoted to each program alternative.

Preschool administrative personnel included salaries and benefits for the program director and a secretary. Interestingly, they reported spending approximately the same proportion of FTE on administrative duties for both programs. District administration includes the school principal, the special education director, and other necessary district administration, as well as the bus drivers and bus aides. The administrative cost of operating the program on the district level was calculated according to the district's indirect rate for operating federal programs (1.1%). Occupancy charges, including space, maintenance, utilities, and insurance costs were based on the school district leasing cost of $6 per square foot per year. One thousand thirteen square feet were allocated for the three-day program, and 1,688 square feet for the five-day program. Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and prorated according to usage by each alternative.

Child transportation included fuel, maintenance, depreciation, and the annualized cost of car seats/restraints. As previously noted, the cost for drivers, bus aides, and transportation administration are included under "administration." Staff travel was based on actual mileage (at $.205 per mile) for the teachers and therapists travel related to the respective intervention programs. The cost of materials and supplies were assessed based on actual usage of these items by each alternative.

Data Collection

At pretest, parents of each subject who participated in the study provided demographic information. All children were administered the Battelle Developmental Inventory (BDI) (Newborg et al., 1984). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. The BDI is being used to assess child outcomes for each of the studies conducted by EIRI. This measure was selected for use based on the finding of an expert panel convened to help EIRI determine appropriate measures. (More information on the BDI and other EIRI measures may be found in the EIRI 1987/88 Annual Report.)

Parents of children in the study also completed the following scales of family functioning at pretest: Parenting Stress Index (PSI; Abidin, 1986), Family Resource Scale (FRS; Dunst & Leet, 1985), the Family Support Scale (FSS; Dunst et al., 1984), Family Inventory of Life Events (FILE; McCubbin et al., 1983), and the Family Adaptability and Cohesion Evaluation Scales III (FACES III; Olson et al., 1985). These measures assessed, respectively: parent stress, family resources, family support, occurrence of recent significant life events, and functioning of the family in respect to an "ideal" family. When possible, the FSS was completed by both parents. These family measures are part of a core battery of instruments used by EIRI. As discussed earlier, family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although, theoretically, it is assumed early intervention will effect families (Bronfenbrenner, 1979), the specific areas that may be impacted are unknown and may vary dependent on type of intervention. The battery of family functioning measures used here will help to elucidate areas of functioning that may be affected.

For each of the two posttests, a similar course of events occurred. Parents of children in the study returned for a test session with their child. The core measures described above were again completed. Parents also provided information on aspects of treatment verification.

Also, at Posttests #1 and #2, a number of measures unique to this study were administered. These complementary measures were used to address issues related to the type of EIRI study (e.g., intensity, program variation, etc.) being investigated.

One measure completed by both the teacher and parent was the System to Plan Early Childhood Services (SPECS) (Bagnato & Neisworth, 1989). SPECS evaluates adult perceptions of child capabilities on 20 developmental dimensions, which encompass seven domains. Impressions of the child may lead to differences in how teachers and other significant adults interact with the child. Staff of the Jordan program expressed their opinions that the intensity differences may impact more heavily on the social/survival skills than on developmental skills. Therefore, this instrument was selected.

In response to similar concerns, the Cooper-Farran Behavior Rating Scale (CFBRS) (Cooper & Farran, 1988) was completed by teachers. The purpose of the CFBRS is to assess behaviors necessary for successful kindergarten adjustment. The CFBRS assesses both interpersonal and work-related skills.

The Joseph Preschool and Primary Self-Concept Inventory (Joseph) was administered to children. The Joseph is a child-administered test of self-concept. Self-concept may be an area of development affected by early intervention that may impact on future school success.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians who administered the BDI and Joseph were either graduate students or certified teachers who were not engaged in full-time work in Special Education or Psychology at either Utah State University or the University of Utah. All diagnosticians were specifically trained in the use of the BDI. This training included an extensive inservice on BDI administration and scoring. Each examiner was also required to administer a minimum of three BDIs, two of which were observed for quality control. Further, each examiner was "shadow scored" for reliability at least once during each test period. For Posttest #1, an average of 9% of all tests were "shadow scored" for interrater reliability. Average agreement was 90% and ranged from 77 to 100%. Eleven percent of all tests were shadow scored for Posttest #2, and average agreement was 91% with a range of 84 to 97%.

For Posttest #1, Josephs were administered by a graduate student in the School Psychology Program at the University of Utah. The site coordinator provided training on the Joseph prior to the first administration. Children were administered the Joseph during their school day. Posttest #2 Josephs were administered by the same diagnosticians who gave the Battelle. Each examiner received training in the Joseph from the site coordinator and the assessment coordinator prior to Posttest #2 administration.

Pretesting. Pretest data were collected at the beginning of the academic year. The specific measures administered and procedures for administration have been detailed above.

First posttesting. All children in the study were administered their first posttest at the end of the first academic year (May and June). Posttesting consisted of the core and complementary measures described above. The results of Posttest #1 are presented and discussed below.

Second posttesting. The second posttesting was completed in June, 1990. The core and complementary measures described earlier were administered to all 53 children who completed intervention. The results of Posttest #2 analyses are presented and discussed next.

Results and Discussion

Thus far, data have been collected one year and two years after the intervention was initiated. Children participated in the different intensities of intervention for only one year. During the second year, an equal number of children from the control and experimental groups were enrolled in preschool programs, while 11 of the control children and 7 from the experimental group were enrolled in public school kindergarten programs. A number of children were enrolled in mixed school programs, this was true for 6 of the control and 8 of the experimental children. The mixed programs were most often special education classrooms which served children of different ages. Overall, there were not large differences in the post-intervention school placements of children from the study. The results of Posttest #1 represent an immediate test of the effects of the different intensity of services provided to children in the study. Posttest #2 is a follow-up to the intensity question and will provide information regarding whether differences between groups appear some time after treatment and whether initial differences are maintained through time.

Comparability of Groups on Pretest Measures

The comparability of groups on demographic characteristics was presented in Table 1.3 and discussed earlier. A difference was observed for 5 of 17 variables in those comparisons. Group differences on family and child pretest measures are presented in Table 1.8. Using the same cut-off value for assessing significance as in the demographic analysis ($p \leq .10$), subjects were comparable on all BDI domains, on the BDI Total score, and for chronological age at pretest. This is supported by the average ES across child and family measures, which equals -.03. On measures of parent and family functioning, group differences were found only on the FACES measure of cohesion. Parents of subjects in the less intensive group indicated a stronger connection of individual family members to the family than the more intensive group.

Table 1.8

Comparability of Groups on Pretest Measures for Jordan Intensity Site

Variable	Less Intensive			More Intensive			p Value	ES[&]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age in months at pretest	50.0	6.8	28	50.3	6.3	25	.88	.04
• Battelle Developmental Inventory (BDI)[*]								
DQs for:								
Personal Social	62.3	17.9	28	60.7	13.7	25	.84	-.09
Adaptive Behavior	64.1	20.7	28	67.4	14.1	25	.40	.16
Motor	64.6	20.5	28	68.2	16.1	25	.49	.18
Communication	56.7	14.8	28	55.5	11.0	25	.78	-.08
Cognitive	63.9	16.6	28	63.5	14.5	25	.91	-.02
TOTAL	61.5	13.6	28	61.7	9.5	25	.78	.01
• Parenting Stress Index (PSI)[**]								
Total (range 101 to 504)	237.5	29.9	28	233.7	55.4	25	.75	.13
Child Related (range 54 to 270)	112.5	17.9	28	114.6	30.3	25	.78	-.12
Other Related (range 101 to 504)	125.0	19.1	28	119.1	30.1	25	.39	.31
• Family Adaptation and Cohesion Evaluation Scales (FACES)'								
Adaptation (range 0 to 26)	4.0	2.5	28	4.5	3.3	25	.54	-.2
Cohesion (range 0 to 30)	3.5	2.6	28	4.9	2.5	25	.05	-.54
TOTAL (range 0 to 40)	5.6	3.0	28	7.0	3.3	25	.13	-.47
• Family Resource Scale (FRS)^ (range 30 to 150)	116.1	15.3	28	122.8	20.2	25	.18	.44
• Family Support Scale (FSS)^ Total Score (range 0 to 4)	2.1	.7	28	2.1	.7	25	.99	.0
• Family Index of Life Events (FILE)[**] (range 0 to 71)	9.8	5.1	28	11.4	7.9	25	.40	-.31

NOTES: [*] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

' Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources reported as being available. Higher scores are considered better. For the FSS, the score presented represents the sum of perceived support divided by the number of reported sources.

[**] The PSI and FILE are based on raw scores where lower scores are considered better.

[&] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, Faces, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

For all other measures of family functioning, including the measures that would suggest differences in the areas of family stress, family resources, family structure, and available family support systems, the two groups were not significantly different when they entered the study. Overall, the groups were comparable on child and family functioning measures at pretest.

Measures of Family and Child Functioning For Posttest #1 and #2

Effects for the measures of family and child functioning were obtained using an analysis of covariance procedure completed on SPSS-PC. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, BDI pretest personal/social score and number of siblings living at home were used as covariates for 12-month Battelle Personal/Social raw scores. The combination of these variables reduced the amount of unexplained variance in the 12-month Battelle Personal/Social raw scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table.

Results of Child Functioning for Posttest #1

Twenty-three child functioning variables were examined and are presented in Table 1.9. The p values at $p \leq .10$ suggest significance for nine child functioning measures (BDI motor, BDI cognitive, and teacher PODS sensorimotor). The p-value of .00 for average length of intervention in days gives further evidence of the design differences between the more intensive intervention of the experimental group as compared to the control group. Seven of the nine significant measures favor the more intensive group. Three of these measure sensorimotor development. The BDI cognitive and total scores also favored the experimental subjects as did the Teacher ratings of general and physical development. Parent ratings of general development favored the less intensive group so that the results in this area of child functioning are inconclusive.

The CFBRS measure of Interpersonal Skills demonstrates a higher value for the less intensive subjects. This indicates better personal/social skills for these subjects as demonstrated in classroom situations. The CFBRS finding in the area of interpersonal skills is not reflected by the BDI personal/social domain. This may have occurred because the teacher completed the CFBRS, where the parent reported on personal/social skills for the BDI.

It is clear from these results that the more intensive intervention resulted in higher motor functioning. The evidence also suggests that higher intensity programming increased cognitive and overall child development as well.

Results of Family Functioning for Posttest #1

Table 1.10 presents the effects of alternate degrees of intensity on measures of family functioning at posttest from the PSI, FACES, FRS, FILE, and FSS. Two variables in this table are worthy of discussion. The Other Related PSI p value ($p = .05$) indicates higher parental stress for the less intensive group than the more intensive. The other tests of family stress are not different between groups.

Table 1.9

Posttest #1 Results of Child Functioning for Jordan Intensity Study

Variable[*]	Covariates[']	Less Intensive				More Intensive				ANCOVA	P	
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	F	Value	ES[^]
Average length of intervention in days	---	109.	2.5	--	28	178	11.4	--	25	977.5	.00	27.6
Average length of intervention in months	---	9	00	--	28	8.88	.60	--	25	1.12	.29	.0
Age in months at posttest	---	57	6.8	--	29	57	7.9	--	25	0.10	.75	.0
Battelle Developmental Inventory												
Personal Social	1,19	110.4	(27.0)	111.2	28	114.4	(22.7)	113.6	25	.34	.56	.09
Adaptive Behavior	2	72.4	(14.9)	73.7	28	76.7	(9.8)	75.4	25	.93	.34	.11
Motor	3,20	98.5	(20.1)	99.9	28	106.4	(18.1)	104.9	25	5.32	.03	.25
Communication	4	54.6	(16.0)	54.1	28	54.4	(13.1)	54.9	25	.11	.74	.05
Cognitive	5	44.9	(12.2)	45.0	28	48.4	(11.8)	48.3	25	3.88	.05	.27
TOTAL	6	380.6	(73.0)	383.0	28	400.3	(57.9)	397.9	25	4.85	.03	.20
Joseph TOTAL	4	17.3	(3.1)	17.3	28	18.2	(5.3)	18.3	24	.90	.35	.32
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	1,9,24	5.5	(.6)	5.4	23	4.9	(.8)	5.0	20	3.34	.08	-.67
WRS	6	3.8	(1.0)	3.9	28	3.8	(1.0)	3.8	23	.04	.85	-.10
Perceptions of Dev. Status (PODS) by Teacher												
General Development	6,25	2.9	(.9)	2.9	28	3.2	(.6)	3.3	25	7.71	.00	.44
Communication	5,2	3.2	(.7)	3.2	28	3.3	(.6)	3.3	25	.81	.37	.14
Sensorimotor	3	3.9	(.6)	4.0	28	4.4	(.4)	4.3	25	15.74	.00	.50
Physical	3,25	3.9	(1.0)	3.9	28	4.2	(.6)	4.2	23	4.94	.03	.30
Self Regulation	6,25	3.5	(.9)	3.5	28	3.6	(1.0)	3.6	23	.39	.54	.11
Cognition	5,11	2.7	(1.0)	2.7	28	3.0	(.8)	3.0	25	1.79	.19	.30
Self-Social	6	3.2	(1.0)	3.2	28	3.5	(.8)	3.5	25	2.03	.16	.30
Parent PODS												
General Development	6,16	3.6	(.8)	3.6	28	3.3	(.7)	3.2	24	3.16	.08	-.50
Communication	1,12,18,20	3.6	(.6)	3.5	28	3.6	(.7)	3.7	24	2.36	.13	.33
Sensorimotor	3,26	4.1	(.5)	4.2	28	4.4	(.4)	4.4	23	7.18	.01	.40
Physical	2,14	4.3	(.5)	4.4	28	4.4	(.5)	4.3	24	.11	.74	-.20
Self Regulation	1,9	4.0	(.6)	4.0	28	3.9	(.8)	3.9	24	.33	.57	-.17
Cognition	1,9	3.6	(.8)	3.6	28	3.5	(.8)	3.5	24	.11	.75	-.13
Self-Social	6	3.9	(.5)	3.9	28	3.8	(.8)	3.7	24	.83	.37	-.40

[*] Statistical Analysis for assessment instruments were conducted using raw scores for each of the scales and these are presented.

[^] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

['] Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home, 20 = Income, 21 = Father's Age, 22 = Age at Pretest, 23 = FACES Discrepancy, 24 = Marital Status of Father, 25 = Father's Occupation, 26 = Mother's Age.

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Table 1.10

Posttest #1 Results of Family Functioning for Jordan Intensity Study

Variable[']	Covariates[']	Less Intensive $\bar{x}$	(SD)	Adj $\bar{x}$	n	More Intensive $\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	P Value	ES[~]
Parenting Stress Index (PSI)[**]												
Child Related (range 47 to 235)	11,19	118.4	(26.4)	117.3	28	112.0	(22.5)	113.1	25	.80	.37	.16
Other Related (range 54 to 270)	12,14	130.5	(17.4)	128.0	28	117.2	(26.1)	119.8	25	4.03	.05	.47
TOTAL (range 101 to 515)	13,19	248.9	(38.7)	245.0	28	229.2	(43.2)	233.1	25	2.52	.12	.31
Family Adaptation and Cohesion Evaluation Scales (FACES)[']												
Cohesion (range 10 to 50)	8,21	2.8	(2.1)	3.1	28	5.3	(3.8)	5.0	22	6.67	.01	-.90
Adaptation (range 10 to 50	9	3.7	(2.7)	3.8	28	3.7	(1.9)	3.7	25	.05	.83	.04
TOTAL (range 0 to 40)	22,10	5.2	(2.6)	5.4	28	6.7	(3.4)	6.6	25	2.59	.11	-.46
Discrepancy (range -80 to 80)	23,21	13.9	(7.1)	12.4	28	9.6	(10.2)	11.1	22	.37	.55	.18
Family Resource Scale (FRS)[&] (range 30 to 150)	14,16	123.0	(15.4)	124.9	28	124.7	(17.7)	122.8	23	.60	.44	-.14
Family Index of Life Events (FILE) (range 0 to 71)	15	9.6	(5.5)	10.0	28	8.9	(6.5)	8.4	25	1.61	.21	.29
Family Support Scale (FSS) Total Score by mother[@] (range 0 to 4)	16	2.0	(.8)	2.0	28	2.2	(.8)	2.2	22	1.62	.21	.25

[**] Analyses for the PSI and FILE are based on raw scores. Lower scores are considered better.

[@] Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

['] Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

[~] Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, Faces, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

['] Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home, 20 = Income, 21 = Father's Age, 22 = Age at Pretest, 23 = FACES Discrepancy.

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The FACES measure of cohesion with a p value = .01 also shows a difference between families of the subjects, with the more intensive group reporting less family cohesiveness than the less intensive group.

Family members who have lower scores on the FACES cohesion indicate a more positive emotional bonding with one another than families that score higher on this test. The same families are indicating a higher level of stress, through their other related PSI score, which includes the following subscales for child characteristics: parent characteristics, including depression, attachment, restriction of role, sense of competence, social isolation, relationship with spouse, and health. Child and parent characteristics such, as acceptability and social isolation, may affect feelings of cohesion and enmeshment in those families. FACES attempts to measure the level of family satisfaction by evaluating the difference between actual family functioning in areas like bonding, coalitions, and interests and those perceived by the family as ideal functioning for the same areas. The less intensive group indicated that their ideal picture of family cohesion was closer to the family's actual level of cohesion than the more intensive group's responses indicated.

It is possible that the increase in motor skills of the more intensive group relative to those of the less intensive group improved the more intensive group's stress score, in particular as it affected health of the family. Of the ten variables of family functioning that were evaluated, it may be more significant that eight of these were not significant. The differences in the remaining two may be due to sampling fluctuation.

Results of Child Functioning for Posttest #2

Examination of the same measures of child functioning as evaluated for posttest 1 reveals that fewer differences exist one year later. The p values, presented in Table 1.11, at $p \leq .10$ suggest only one difference between the subjects in the intensity comparison. Only one measure, the Cooper-Farran Behavior Rating Scale

Table 1.11

Posttest #2 Measures of Child Functioning for the Jordan Intensity Study

		Less Intensive				More Intensive						
Variables	Covariates'	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES^
Average length of intervention in days	----	109.0	(2.5)	---	28	178.0	(11.4)	---	25	977.5	.0	27.6
Average length of intervention in months	----	9.0	(0.0)	---	28	8.8	(.6)	---	25	1.1	.29	.0
Age in months at posttest	----	68.9	(6.9)	---	28	69.8	(6.7)	---	25	1.1	.62	.13
Battelle Developmental Inventory												
Personal/Social	1,20	133.2	(28.6)	131.4	28	131.0	(23.3)	132.8	25	.08	.78	.05
Adaptive Behavior	2,21	84.0	(16.2)	85.6	26	83.7	(13.1)	82.1	23	1.14	.29	-.22
Motor	3,22	113.6	(28.4)	116.0	28	122.0	(21.4)	119.6	25	1.49	.23	.13
Communication	4,23	66.2	(18.6)	64.8	28	63.7	(13.3)	65.1	23	.01	.92	.02
Cognitive	5,20	61.1	(23.2)	60.6	28	58.3	(16.1)	58.9	25	.25	.62	-.07
TOTAL	6	458.1	(99.0)	460.9	28	460.5	(69.2)	457.7	25	.07	.79	-.03
Joseph TOTAL	6,24	23.1	(6.0)	23.0	28	21.7	(5.5)	21.9	23	.69	.41	-.18
Cooper-Farran Behavior Rating Scale (CFBRS)												
IPS	6	52.1	(10.7)	52.2	28	46.1	(14.5)	46.0	23	4.05	.05	-.58
WRS	6	37.3	(12.0)	37.5	28	37.7	(12.6)	37.5	23	.00	.98	.00
Perceptions of Develop. Status by Teacher												
Communication	5,23	6.5	(1.6)	6.4	28	6.3	(1.4)	6.5	21	.06	.81	.06
Sensorimotor	3	16.1	(2.2)	16.2	28	16.8	(2.2)	16.7	23	1.12	.30	.23
Physical	3,19	12.5	(2.1)	12.8	28	12.9	(2.2)	12.6	23	.17	.68	-.10
Self Regulation	23	15.1	(3.3)	14.9	28	14.0	(4.1)	14.3	21	.33	.57	-.18
Cognition	5,23	6.0	(2.5)	5.9	28	6.1	(1.9)	6.2	21	.41	.53	.12
Self-Social	6,24	13.1	(3.9)	12.9	28	13.7	(4.1)	13.9	23	1.33	.26	.26
Perceptions of Develop. Status by Parent												
Communication	5,27	7.5	(1.6)	7.4	28	6.7	(1.2)	6.8	23	2.72	.11	-.38
Sensorimotor	3	17.6	(2.0)	17.8	28	17.9	(1.4)	17.8	24	.01	.94	.00
Physical	3,21,25	13.3	(1.1)	13.3	27	13.4	(1.4)	13.4	23	.27	.61	.09
Self Regulation	27,14	16.1	(2.6)	16.1	28	15.1	(2.7)	15.2	24	1.54	.22	-.35
Cognition	5,27,24,23	7.8	(1.6)	7.4	28	7.0	(1.8)	7.3	22	.02	.89	-.06
Self-Social	6,26	16.1	(2.2)	16.3	27	15.2	(3.2)	15.1	20	3.94	.05	-.55

* Statistical Analysis for assessment instruments were conducted using raw scores for each of the scales and these are presented.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

' Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home, 20 = Sex, 21 = DEGREEF, 22 = School, 23 = OCCF, 24 = Hours in Daycare, 25 = Income, 26 = Hours Worked by Father, 27 = FACES Perceived.

(CFBRS) measure of Work Related Skills, is significant in favor of the less intensive group.

None of the differences which favored the more intensive group at Posttest #1 is maintained for the same measures at Posttest #2. The BDI motor, BDI cognitive,

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BDI Total, and teacher and parent SPECS sensorimotor differences measured at Posttest #1 have disappeared. The teacher completed CFBRS measure of Interpersonal Skills provides evidence that the less intensive group no longer has better personal-social skills in the classroom, although they have better work-related skills.

The results from the BDI and SPECS suggest that any gain that the more intensive group might have achieved in the areas of overall, motor and cognitive development have disappeared or are rapidly fading.

Results of Family Functioning for Posttest #2

The results of Posttest #2 measures of family functioning are presented in Table 1.12. While the results show no significant differences between the groups on the Parent Stress Index (PSI), the groups do differ on the Adaptation measure of Family Adaptability and Cohesion (FACES), the Family Resource Scale and the Family Support Scale. The p-values for these measures are significant using a cutoff of $p \leq .10$.

The less intensive families report a higher FACES adaptation score, suggesting that they are less flexible and able to change in a variety of situations. The FACES measure of Cohesion, while it favors the less intensive group, is not significant nor is the FACES total, which incorporates measures of adaptability and cohesion not significantly different between groups. The more intensive families also scored lower on the Family Resource Scale, indicating that they have fewer of the resources which are valuable to families. The total FRS incorporates measures of physical and financial resources as well as time resources. The more intensive families reported higher levels of support as indicated by the FSS p-value = .09 and effect size = .42.

Table 1.12

Posttest #2 Measures of Family Functioning for the Jordan Intensity Study

Variables	Covariates*	Less Intensive				More Intensive				ANCOVA F	P Value	ES^
		$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n			
Parenting Stress Index** (PSI)												
Child Related (range 47 to 235)	11	110.0	(26.3)	110.7	28	115.8	(23.6)	115.1	25	.67	.42	-.17
Other Related (range 54 to 270)	12,14,8	125.6	(20.3)	120.2	28	122.0	(32.5)	127.3	24	1.7	.2	-.35
TOTAL (range 101 to 505)	13	235.6	(41.6)	233.1	28	237.7	(51.4)	240.2	24	.48	.49	-.17
Family Adaptation and♣ Cohesion Evaluation Scales (FACES)												
Cohesion (range 10 to 50)	8	3.1	(2.6)	3.4	28	4.9	(3.3)	4.6	25	2.5	.12	-.46
Adaptation (range 10 to 50)	9,14	5.0	(3.1)	5.0	28	3.5	(3.1)	3.5	25	3.67	.06	.48
TOTAL (range 0 to 40)	10	6.2	(3.4)	6.6	28	6.6	(3.6)	6.2	25	.23	.64	.12
Family Resource Scale (FRS)& (range 30 to 150)	14	122.0	(12.8)	124.2	28	119.1	(20.7)	116.9	25	4.54	.04	-.57
Family Support Scale (FSS) Total Score by mother@ (range 0 to 4)	16	26.5	(9.2)	26.6	27	30.6	(10.1)	30.5	22	2.97	.09	.42

** Analyses for the PSI is based on raw scores. Lower scores are considered better.

@ Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

♣ Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

& Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

^ Effect Size (ES) is defined here as the difference between the groups (More Intensive minus Less Intensive) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, Faces, and FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

* Covariates: 1 = BDI Personal Social, 2 = BDI Adaptive Behavior, 3 = BDI Motor, 4 = BDI Communication, 5 = BDI Cognitive, 6 = BDI Total, 7 = BDI Expressive Communication, 8 = FACES Cohesion, 9 = FACES Adaptation, 10 = FACES Total, 11 = PSI Child Related, 12 = PSI Other Related, 13 = PSI Total, 14 = FRS Total, 15 = FILE Total, 16 = FSS Total (mother), 17 = FSS Total (Father), 18 = Mothers year of Education, 19 = Number of Siblings Living at Home.

Conclusions

The results described here are based on two posttests. This study compared two common intensities of preschool intervention for children with disabilities; a 3-day-per-week vs. a five-day-per-week program. Results from the Battelle Developmental Inventory, on the motor, cognitive and total scores favored the more intensive

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group for the first posttest only. These differences were virtually nonexistent by the second posttest. Parent and teacher perceptions of child motor development were similarly affected by the program at Posttest #1; both favored the augmented subjects. This difference in parent and teacher perceptions of subjects had disappeared by Posttest #2. The more intensive group achieved lower development on interpersonal skills as rated by teachers for both Posttest #1 and on work-related skills for Posttest #2.

The results from measures of family functioning are mostly equivocal. Parent stress was higher in the less intensive group for Posttest #1, this difference was not significant for Posttest #2. The less intensive group was more cohesive at both posttests, although this was significant only at Posttest #1. The more intensive group, while equivalent on the FACES adaptability score at Posttest #1, had scores suggesting a more adaptive family unit for Posttest #2. The FRS favored the less intensive group, while the FSS favored the more intensive group at Posttest #2. It is very possible that these small family effects are not due to the intervention but are the result of other events affecting families.

Overall, these results suggest a benefit on developmental skills resulting from the more intensive program immediately following intervention. This difference did not persist so that by Posttest #2 the groups were, for the most part, equivalent. The gains in motor skills made by the more intensive subjects as measured by the effect size of the BDI and SPECS implied a 1/3 to 1/2 standard deviation increase in motor skills above the control subjects. This temporarily moved the more intensive subjects from the second percentile level of motor development to the fifth percentile for their age group. The cognitive and total measures of development suggest a 1/4 standard deviation gain for the more intensive group above the control group. As was true of the motor differences, the cognitive and total scores did not exist at Posttest #2. The temporary nature of these gains is not surprising as it is confirmed by another intensity study (Sandow et al., 1980) which found similar immediate differences that disappeared with time.

A one year of 1/4 to 1/2 a standard deviation increase in motor, cognitive, and total development cost $2,000 per child, or a 70% higher level of spending on the more intensive group relative to the less intensive subjects to achieve these gains. Several questions remain unanswered by these results. Will the temporary gain in motor skills of the more intensive children result in long-term gains in other achievements in their lifetimes? Would the greater gains in motor skills persist if the more intensive subjects had continued in more intensive center-based programs? There may be benefits that result from the increased spending of the more intensive program that do not appear in the measures used to capture differences in child and family functioning. These differences may appear in the lives of the children as they move through primary and secondary school and into adulthood. These benefits must be weighed against program costs and the needs of a district.

NEW ORLEANS VISUALLY IMPAIRED STUDY (NO/VI)

Project #2

COMPARISON: Visually Impaired Children -- Weekly individualized parent-infant sessions versus parent group meetings.

LOCAL CONTACT PERSON: David Slade, University of New Orleans

EIRI COORDINATOR: Diane Behl

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 4-8-1991

Rationale for Study

The importance of vision in early development is crucial (see discussions by Barraga, 1986; Ferrell, 1986; Fraiberg, 1977; and Warren, 1984). By age three, infants with visual impairments often demonstrate socio-communicative and cognitive development patterns that are quantitatively and qualitatively different from their sighted peers (Ferrell, 1986; Warren, 1984). Ferrell (1986) stated that all of these secondary disabilities are preventable; they occur because there has not been sufficient, systematic intervention given to the child and his/her family. Although such a position is logical, there is little evidence in the literature which either confirms or refutes the value of systematic intervention in alleviating these secondary disabilities.

Visual impairment also causes a disruption in the interaction between the caregiver and child. Als (1983) observed that the infant with visual impairments signals and communicates differently. These signals are often distorted and difficult to interpret, making positive, constructive interaction even more difficult for parents who often are attempting to cope with the emotions of having an infant with a disability. Rowland (1984) summarized the position of most researchers involved with children with visual impairments by stating, "The importance of appropriate exchanges between mothers and infants cannot be overstressed."

Though the importance of early intervention for children with visual impairments and their families has been noted frequently in literature, few controlled prospective studies have been completed on children with visual impairments, especially at the infant and toddler levels (Warren, 1984). Furthermore, even though researchers speculate that intensive intervention for both child and family is necessary, there is a dearth of evidence regarding the intensity with which this intervention should be provided. Additionally, little data are found to assist in answering the question of how to provide the best intervention (White et al., 1985-86).

This study of early intervention for infants and toddlers with visual impairments compares the immediate and long-term effects of a comprehensive, home-based intervention in the form of one time per week parent-child sessions, with a much lower intensity treatment of informal parent group meetings held approximately 12 times per year. To set the context for this study, existing research on the effects of early intervention with visually impaired children will first be summarized briefly. A description of this study will follow, providing a description of the subjects and the alternative interventions, as well as the research procedures. Results based on the first two years of the study then will be presented along with conclusions.

Review of Related Research

Since 1969, eight studies with quasi-experimental designs and appropriate outcome data have been conducted with visually impaired children in an attempt to provide some degree of objective information on the effectiveness of early intervention. The nature of these studies, including subjects, intervention, outcome measures, and results are summarized in Table 2.1. Unfortunately, as will be discussed below, critical components necessary for previous studies to be considered well-controlled investigations were lacking.

One of the most serious problems with past research is the lack of appropriate comparison groups; the visually impaired subjects were typically compared to either normally sighted peers or a blind comparison group from a previous study (see Table 2.1). The current study improved upon these research designs by using random assignment of a sample of children with visual impairments to one of two treatment conditions. In addition to lacking appropriate comparison groups, the conclusions of these previous studies are difficult to interpret because very little demographic information is presented about participating subjects (i.e., it is difficult to know whether subjects who come from families with high socioeconomic status respond differently to intervention than subjects who come from families with low socioeconomic status, or whether subjects who are more severely visually impaired respond differently than those who have moderate visual impairments). Because of the extensive demographic data collected as a part of this study, such questions can be examined.

Another point relative to previous research is that exemplary services designed for children with visual impairments have generally been described as needing to be comprehensive in nature, providing systematic instruction to the child as well as providing parents with instructional strategies and support. Unfortunately, most previous studies have not provided clear descriptions of their interventions. The lack of information about the expertise of the intervenors, specific training techniques, curricula, and shaping procedures has made it difficult to understand the comprehensiveness of previous treatments as well as making it difficult for others to replicate the interventions (Guralnick & Bennett, 1987). The collection of treatment verification data by the study, described more fully in a subsequent

Table 2.1

Summary of Early Intervention Studies Involving Children with Visual Impairments

Reference	Children (age, n)	Intervention Description	Experimental Design	Outcome Measures	Conclusions	Weaknesses
Adelson & Fraiberg (1974)	10 infants, mod-severely VI, no other handicaps.	Bimonthly home visits for 1-2 years. Developmental guidance program linking sound and touch in play and parent-infant interactions.	Posttest only compared with sighted control and with large group of VI infants from earlier study.	Gross Motor items from Gessell & Amatruda, Bayley Scales of Infant Development.	Intervention can accelerate development of mobility in children with visual impairments.	-- Small sample -- Comparison VI group had almost 3 times as many premature infants or had later entry ages Visits in control (VI) group every 3 months -- No random assignment -- Control group used different outcome measures
Allegheny County Schools (1969)	Seven preschoolers, all legally blind with varying developmental levels.	6 weeks of center-based training emphasizing exploration and independence.	Pre-posttest	Orientation and mobility of Young and Blind Children (Lord, 1967) Body image of Blind Children Screening Test (American Foundation) Video tapes over time	Intervention improved several aspects of self-help, vision, and socialization.	-- Small sample -- No control group -- Possibly had inconsistent program. -- No treatment verification.
Bregani et al (1981)	8 infants and toddlers with ROP	Weekly 1-hour visits for 1 year focused on parent child interaction.	Pre-posttest	Brunet-Lezine Scale of Psychomotor Development, Neurological and ocular exams	Intervention had positive effects on mother-infant dyads presumed to be at-risk for psychotic disturbances.	-- Small sample -- No control group
Correa, Poulson, & Salzburg (1984)	3 preschool children, severely multiply handicapped	One-time training in reach-grasp responding conducted in a center.	Multiple baseline design.	Recording of reach-grasp responses.	Intervention effective for training motor skills in blind, severely retarded preschoolers.	-- Small sample -- No control group -- More than one handicap -- Not typical intervention
Fraiberg (1977)	10 blind infants, no other handicaps.	Twice-monthly home visits for three years focusing on parent-child interactions.	Pre-posttest	Videotaped performance	Intervention improved VI children to levels closer to sighted children than blind children who received no intervention.	-- Small sample size -- No control group
O'Brien (1976)	33 subjects, Birth to 8 years with mild to severe VI	Home or center-based, parent training for 8 months emphasizing overall development.	Pre-posttest	Visual Effic. Scale, school health forms, Bolea Pictorial Self-Concept Scale, Boehm Test of Basic Concepts (1971), anecdotal records, instruments developed by researchers.	Program goals were met	-- Not all instruments standardized. -- No control group. -- No uninformed testers. -- Interventions differed across subjects
Olson (1983)	15 VI 2-6 year olds	Home or school intervention for an average of 2.7 years.	Post-only comparison based on initial differences and sighted control group.	Performances rated by teachers of VI children, independent viewing and scoring of 10 categories of behavior.	Intervention created no significant difference between sighted and visually impaired children.	-- Differences in past education confound study -- No VI control group -- Interventions differed across subjects
Rogow (1982)	10 subjects 1-7 years of age, multihandicapped	Home or school intervention for 10 months using graduated prompting strategies.	Pre-post	Piagetian stages of language development to determine child's functional level of communication via parents, teachers, videotapes	Intervention increased awareness of social interaction.	-- No non-treatment group Small sample size -- Very heterogenous group -- Intervention differed across subjects

Adapted from Olson, M. (1987). Early intervention for children with visual impairments. In M. J. Guralnick & F. C. Bennett (Eds.), The effectiveness of early intervention for at-risk and handicapped children (pp. 318-321). Orlando, FL: Academic Press.

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section, provides specific information facilitating replication of any effective treatments.

The use of a home-based intervention as the high intensity treatment was chosen for several reasons. Home-based programs serving young children who are disabled or at-risk are experiencing rapid growth, making it one of the most typical intervention models in the field (Halpern, 1984). Philosophically, there are numerous advantages to a home-based intervention and the involvement of the family. Some of the earliest advocates of home-based intervention, Shearer and Shearer (1976) argued that home-based intervention was good because:

> (1) Learning occurs in the parent and child's natural environment.... (2) There is direct and constant access to behavior as it occurs naturally.... (3) It is more likely that learned behavior will generalize and be maintained.... (4) There is more opportunity for full family participation in the teaching process.... (5) There is access to the full range of behaviors.... (6) Training of parents, who already are natural reinforcing agents, will provide them with the skills necessary to deal with the new behaviors when they occur ... and (7) Because the home teacher is working on a one-to-one basis with the parents and child, individualization of instructional goals for both is an operational reality. (pp. 336-337)

There are also advantages to home based intervention that are more practical in nature. For rural or low-income families, travel to a center location is often difficult. Additionally, some children have medical needs that make leaving the home difficult (Bailey & Simeonsson, 1988). In spite of these theoretical and practical justifications for home-based intervention, previous research has provided very little evidence about the effectiveness of home-based intervention, particularly for children with visual impairments. This controlled study comparing a well-designed treatment serving both parent and child with a control condition of substantially lower intensity which provides indirect services only to the parents, will add greatly to the knowledge needed to respond to the aforementioned questions.

As a third point, the majority of previous studies have also failed to measure critical outcomes that may have been affected by the intervention. Using a family-focused approach, the high intensity intervention is sensitive to the effects of the child on the total family, the effects of the family on the child, and the effects of external supports on the child and family. Through the use of measures sensitive to these interactions, this study will provide important assessment data that have been missing from previous studies (see Table 2.1).

Fourth, longitudinal data are needed to determine whether effective early intervention programs continue to have a noticeable effect on children as they get older (Warren, 1984). Though five of the eight previously cited studies with children with visual impairments had interventions that were at least eight months in duration, none of them provided information regarding long-term effects of the treatment. Since this study includes outcome data for several years following the treatment, it provides some needed information concerning long-term treatment results.

Finally, this study provides an economic perspective on early intervention. One would expect the intensive program to be much more expensive. Therefore, it is important to find out whether the additional costs are justified in terms of the gains made by children or the effects on the family. Furthermore, it is important to find out whether less expensive program such as the low intensity parent group meetings may result in some benefits (e.g., positive effects on family functioning) that may not be present in the more expensive program which focuses more directly on child progress. Unfortunately, very little attention has been given to cost analysis issues in previous early intervention research, particularly with children with visual impairments.

Methods

Services for children in both groups were funded by the Louisiana Office of Education. The service program was developed by a certified teacher of the visually impaired with extensive experience in service provision and research. Staff who provided direct services included special educators, a social worker, and consulting service providers who are therapists at the Human Development Center at Louisiana State University Medical Center. The program was developed for the research project and provided services to children with visual impairments and their families who would otherwise receive no services designed for children with visual impairments.

The geographical area served included the area within a 60-mile radius of New Orleans. Other services available for 0- to 3-year-old children with visual impairments were limited to programs designed to serve children with developmental delays or those that provided private motor and/or speech/language therapy. There was no other program in the area that provided programming specifically to meet the needs of children who are visually impaired. Consequently, most 0- to 3-year-old children with visual impairments in this area have typically not received any services until they were 3 years old.

Assistance in the identification of potential research subjects, as well as information regarding various aspects of the subject's vision (i.e., acuity, perception, and discrimination), was provided by the Louisiana State University (LSU) Eye Center.

Subjects

A total of 36 children between the ages of 0 to 30 months were identified and randomly assigned to groups as of July 1, 1990. The following section describes the recruitment and random assignment procedures for the study. Demographic characteristics of children and families in each group are also summarized.

Recruitment. Subjects were identified through referrals from the LSU Eye Center and from pediatricians and ophthalmologists in the New Orleans area. Children who were identified as potential subjects were screened by either the site liaison or a teacher and therapist. Each child was classified according to visual acuity, presence of other disabilities, and developmental level as follows.

Visual acuity:
1 = blind
2 = severely impaired with correction
3 = mildly or moderately impaired

Handicapping condition:
1 = no other handicapping condition
2 = presence of one or two mild handicaps
3 = more than two mild or severe handicaps

Developmental level:
1 = no more than a 33% delay in motor or socio-communication/cognitive areas
2 = more than 33% delay in either motor or socio-communication/cognitive areas
3 = more than 33% delay in both motor and socio-communication/cognitive areas

The presence of an additional disability was determined by the clinical judgment of qualified motor therapist and/or communication disorders specialist. Developmental level was obtained through the use of a screening instrument that consisted of selected items from the Early Intervention Developmental Profile (Brown et al., 1981). Children were eligible for inclusion in the study if the vision impairment was the major disability and the delays were due primarily to their vision impairment. Children who had more than two other disabilities and who had more than a 33% delay in both motor and socio-communication/cognitive areas were not eligible for enrollment in the study.

As seen in Table 2.2, approximately 2/3 of the subjects had mild vision impairments (between 20/200 and 20/900), with the remaining 1/3 distributed in moderately and severely visually impaired groups. The majority of subjects for both groups were rated as having no additional disability and/or significant developmental delay.

The most frequently-occurring causes of vision impairment for subjects were optic atrophy (10.3%), retinopathy of prematurity (31.0%), and albinism (17.2%); other etiologies were present in smaller numbers.

Assignment to groups. After receiving a signed informed consent form from parents, children were randomly assigned to groups stratified by visual acuity, and

Table 2.2

LSU VI Intensity Study Subjects' Degree of Vision and Severity of Handicaps

	Low Intensity	High Intensity
Severe Vision Impairment $\leq$ 20/2400	17%	22%
Moderate Vision Impairment $\leq$ 20/900	11%	11%
Mild Vision Impairment $\leq$ 20/200	72%	67%
Handicapping Condition/Developmental Delay:		
No additional handicap/ developmental delay	67%	56%
1-2 mild-moderate handicap/ developmental delay	33%	44%

a combined score for disability and developmental level. (Refer to the EIEI 1986-1987 report for a more detailed description of the assignment procedures). On February 13, 1987, the initial group of 15 children identified during screenings in the first two weeks of February were rank-ordered by age within the cells. The random assignment pattern was determined for each cell by a computer-simulated four-sided die. Children were assigned based on this pattern within cells. Children who were identified after that date were placed in the appropriate cell and assigned according to the assignment pattern.

Demographic characteristics. Demographic pretest data on all subjects enrolled as of July 1, 1990, are reported in Table 2.3. The population from which children were drawn was about 80% Caucasian and had a high degree of variability with respect to socioeconomic status. Although not statistically significant, there were some differences between groups (e.g., see percent receiving public assistance, with more subjects in the high intensity group receiving assistance; hours per week the mother is employed, with mothers in the low intensity group working more hours; and percent of children in daycare, with more children in the high intensity group being in

Table 2.3

Comparability of Groups on Demographic Characteristics for NO/VI Intensity Study: All Subjects Enrolled by August 1, 1990

	Low Intensity			High Intensity			p Value	ES ^
	$\bar{x}$	SD	n	$\bar{x}$	SD	n		
• Age of child in months at pretest	13.9	(10.0)	18	12.3	(11.7)	18	67	-.16
• Age of mother in years	25.7	(4.2)	18	27.3	(6.5)	17	40	-.38
• Age of father in years	31.1	(8.4)	16	33.3	(10.4)	16	.54	+.26
• Percent Male*	39%		18	56%		18	.33	+.34
• Years of Education--Mother	12.9	(1.7)	18	12.9	(2.6)	18	1.0	.00
• Years of Education--Father	13.3	(2.8)	15	13.1	(3.1)	17	.84	-.07
• Percent with both parents living at home	72%		18	83%		18	44	+.24
• Percent of children who are Caucasian*	78%		18	83%		18	68	+.12
• Hours per week mother employed	15.9	(18.7)	18	7.8	(15.9)	18	17	-.43
• Hours per week father employed	40.7	(14.9)	11	39.3	(19.5)	16	.83	-.09
• Percent of mothers employed as technical managerial or above*	33%		18	11%		18	12	-.45
• Percent of fathers employed as technical managerial or above*	36%		14	53%		15	.36	+.34
• Mean total household income (median)	$24,583 $25,000	($17,046)	18 18	$27,138 $13,000	($27,648)	18 18	74	+.15
• Percent receiving public assistance*	22%		18	44%		18	17	+.51
• Percent with mother as primary caregiver*	83%		18	89%		18	64	+.16
• Percent of children in day care more than 5 hours per day*	44%		18	18%		17	09	-.51
• Number of siblings	.72	(.9)	18	.76	(.8)	17	.89	+.04
• Percent with English as primary language·	100%		18	100%		18	1.00	0.0

NOTES:

^ Effect Size (ES) is defined here as the difference between the groups (expanded minus basic) on the $\bar{x}$ scores divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size). The positive or negative sign of the ES only indicates direction of difference; no value judgement is intended.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored at "0."

· Means and standard deviations for this variable were estimated from categorical data.

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extended care). Some demographic data related to the father are missing due primarily to single parent families with estranged fathers. Differences in median household income appear to be due to a few high-income families skewing the mean.

Tables 2.4 and 2.5 portray the demographic characteristics of subjects included in Posttest #1 and #2, respectively. In spite of the attrition, the comparability of the low and high intensity groups remained essentially identical to the comparability of all subjects enrolled.

Intervention Programs

The alternative interventions consisted of weekly individualized home-based intervention versus parent group meetings that are held approximately 12 times per year. A detailed description of the treatments follows.

High intensity weekly individualized treatment. The more intensive intervention for 0- through 30-month-old subjects consisted of parent-infant sessions in which parents or primary caregivers and their children were given a systematic program individualized to meet the needs of the family as well as the child.

All infants/toddlers in the individualized treatment group were scheduled for an average of 1 hour of intervention services weekly. Generally, intervention services were provided in the child's home. The activities incorporated daily routines, such as feeding, diapering and changing, as well as familiar toys and household items. In three instances, it was necessary for families to travel to the program center for intervention services. The travel expenses for these families were covered through program funds.

The model of intervention was based on the guidelines set forth by P.L. 99-457 in regard to serving the families of children ages birth through 3 years of age. A case manager coordinated services for the family. The case manager was typically the education specialist, but depended on the unique needs of the family. Individualized Family Service Plans were developed to meet needs of the child and family.

Table 2.4

Comparability of Groups on Demographic Characteristics for NO/VI Intensity Study: Subjects Included in Posttest #1

	Low Intensity			High Intensity			p Value	ES ^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age of child in months at pretest	14.5	(10.0)	17	13.1	(12.5)	14	.75	-.14
• Age of mother in years	25.5	(4.3)	17	28.4	(6.7)	14	14	+.67
• Age of father in years	31.4	(8.7)	15	35.0	(10.4)	13	.32	+.41
• Percent Male*	41%		17	57%		14	39	+.31
• Years of Education--Mother	13.0	(1.8)	17	13.1	(2.8)	14	93	+.06
• Years of Education--Father	13.3	(2.9)	14	13.6	(3.3)	13	79	+.10
• Percent with both parents living at home	71%		17	86%		14	33	+.32
• Percent of children who are Caucasian*	76%		17	86%		14	53	+ 27
• Hours per week mother employed	16.9	(18.9)	17	6.9	(14.7)	14	12	-.53
• Hours per week father employed	40.8	(15.7)	10	39.5	(21.8)	13	87	-.08
• Percent of mothers employed as technical managerial or above*	35%		17	14%		14	20	-.43
• Percent of fathers employed as technical managerial or above*	38%		13	67%		12	17	+.57
• Mean total household income · (median)	$25,264 $27,500	($17,316)	17 17	$32,178 $17,750	($29,511)	14 14	45	-.40
• Percent receiving public assistance*	24%		17	36%		14	47	+ 27
• Percent with mother as primary caregiver*	82%		17	86%		14	.80	+.01
• Percent of children in day care more than 5 hours per day*	47%		17	15%		13	.07	-.67
• Number of siblings	.65	(.86)	17	.77	(.93)	13	.71	+.14
• Percent with English, as primary language	100%		17	100%		14	1.00	0.0

^ Effect Size (ES) is defined here as the difference between the groups (high minus low) on the $\bar{x}$ scores divided by the standard deviation of the Low Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size). The positive or negative sign of the ES only indicates direction of differences; no value judgment is intended.

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored at "0."

· Means and standard deviations for this variable were estimated from categorical data.

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Table 2.5

Comparability of Groups on Demographic Characteristics for New Orleans VI for Subjects Included in Posttest #2

	Low Intensity			High Intensity				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Age of child in months at Pretest	14.9	(10.1)	15	13.8	(12.8)	13	.80	-.11
• Age of mother in years at pretest	25.9	(4.4)	15	28.9	(6.5)	13	.15	+.68
• Age of father in years at pretest	32.6	(8.5)	13	35.0	(10.4)	13	.53	+.28
• Percent Male[*]	40		15	54		13	.48	+.27
• Years of Education for Mother	13.1	(1.8)	15	13.2	(2.9)	13	.98	+.06
• Years of Education for Father	13.2	(3.0)	12	13.6	(3.3)	13	.73	+.13
• Percent with both parents living at home	73		15	92		13	.21	+.41
• Percent of children who[*] are Caucasian	87		15	85		13	.88	-.06
• Hours per week mother employed	19.1	(19.0)	15	7.4	(15.1)	13	.09	-.62
• Hours per week father employed	45.3	(6.7)	9	39.5	(21.8)	13	.38	-.87
• Percent of mothers[*] employed as technical managerial or above	40		15	15		13	.16	-.49
• Percent of fathers[*] employed as technical managerial or above	45		11	67		12	.33	+.42
• Mean total household[♦] income	$26,633	($17,415)	15	$33,923	($29,956)	13	.43	+.42
(median)	$32,500		15	$22,500		13		
• Percent receiving public[*] assistance	20		15	31		13	.53	+.27
• Percent with mother as[*] primary caregiver	80		15	85		13	.76	+.12
• Percent of children in[*] daycare more than 5 hours per day	53		15	17		12	.05	-.69
• Number of siblings	.7	(.9)	15	.8	(.9)	12	.64	+.18
• Percent with English[*] as primary language	100		15	100		13	1.00	.00

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1" and those not possessing the characteristic were scored "0."

[♦] Means and standard deviations for this variable were estimated for categorical data.

[^] Effect Size (ES) is defined here as the difference between the groups (High minus Low) on the means scores divided by the standard deviation of the Low Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for more general discussion of the concept of Effect Size). The positive or negative sign of the ES only indicates direction of differences; no value judgment is intended.

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During the home visits, the primary caregiver was involved in the intervention with the child. With some families, the role of caregiver varied among parents, grandparents, babysitter, and preschool teacher. In any event, the person with primary caregiving responsibility for the child at the time was the active participant in the session. In instances in which a parent was not the primary caregiver during program intervention sessions, every effort was made to share information with them in telephone contacts and other visits. For example, one child attended a regular preschool, 5 days a week, and the program teacher provided services there. Meetings were held between program staff, preschool staff, and the parent to discuss and plan strategies and exchange information. All parties were pleased with this pattern of service delivery, which appeared to be the most natural setting for this child.

The degree of caregiver involvement in any one session was individualized according to the needs and skills of the caregiver. The role of the intervenor during the sessions may have been assumed almost entirely by the caregiver, with the program teacher guiding and giving feedback. In other instances, the program teacher demonstrated while the caregiver observed. In most sessions, there was a combination of these patterns. New activities were generally first introduced by the program teacher, who then instructed the caregiver in implementing the activity. Parents were involved in implementing stimulation activities, collecting data, and charting behavior in the home between sessions.

In addition to focusing on specific needs of the individual infant/toddlers, the needs of the family in relation to the child were addressed. Treatment reflected the family's needs in regard to interacting with the child, developing their general knowledge of visual impairments, and improving their skills in encouraging their child's development. Needs for assistance or guidance in obtaining community services such as medical or daycare services for their child were also addressed.

The Louisiana Curriculum for Infants with Handicaps, which was developed by the staff of the Human Development Center, formed the basis for development of intervention activities for this program. The activities in the curriculum take into account the total child and the interactive nature of development across domains. The curriculum was augmented with strategies addressing visual impairments.

Activities (lessons) were developed for the domains of gross motor, fine motor, cognition, self-help, social-emotional, and communication. Information with each lesson included: area, goal, rationale, materials, cautions, teaching procedures, teaching notes, and evaluation criteria. A data collection sheet was available for use by parents and program staff.

A Curriculum Placement Instrument (CPI) for each domain was used for choosing activities appropriate for the status of child and family. Modifications were made in specific activities in the curriculum, in consultation with the professional staff, to adapt them to the child's needs and as appropriate for the child's vision.

In addition to the observation and modeling provided by the program teacher, parents were provided instructions on how to implement a specific lesson and the type of weekly data to be collected. Often parents requested information on a particular topic related to visual impairment or child development. The home intervenor provided supplemental information from the Reach Out and Teach curriculum (Ferrell, 1986). This is a manual designed to provide parents with information about visual impairments and appropriate general stimulation activities.

During 1987-1988, the education specialist was the primary contact person working closely with the parents or other caregivers to provide the intervention. The education specialist planned sessions and activities, guided interventions, collected data, maintained attendance records and individual child folders, and coordinated consultations and direct services from other professionals. These two education specialists were certified teachers experienced in serving young children with special needs. The speech therapist, occupational therapist, physical therapist and social worker from the Human Development Center at Louisiana State University assisted in meeting needs of the participating infants/toddlers and their families. All children were seen, initially, by at least one of these specialists in the screening process. Depending upon the impairments of the child and needs of the family, the specialists were called upon for consultation with the program teacher and/or parents, or for provision of direct services. For example, the speech therapist might have assisted the teacher to design a feeding program, and the OT and PT might have provided direct services for children with gross and fine motor problems. During 1988-1989, the role of the social worker was expanded to provide more direct intervention with families. The social worker maintained close contacts with the families, interacting with them 1-2 times per month. In fact, often the social worker was the case manager.

A certified teacher of the visually impaired supervised the home interventions and offered programming suggestions. Although the intervenors were certified special education teachers, they were not certified or specifically trained in the field of visual impairment. However, as current literature points out, there is a scarcity of teachers with certification for the visually impaired, resulting in many children with visual disabilities receiving services from generically trained teachers, which meets compliance regulations in many states (Silberman, Corn, & Sowell, 1989). Therefore, this service delivery model is one that is representative of many programs serving children with visual impairments.

Low intensity parent group treatment. Families in the low intensity control group were offered services in the form of group meetings which were held approximately 12 times per year for roughly one hour each. During 1987 and the majority of 1988, parent group meetings were conducted about twice monthly for approximately 9 months out of the year. Due to staff and funding changes, meetings in 1988-1989 were rescheduled to be held in two sessions, each session consisting of 6 weekly meetings. Although informal, there was always a specific topic for discussion, with readings assigned and time for questions and answers. Slides and tapes developed for use with Reach Out and Teach had also been used. After an introductory meeting, appropriate professionals attended the meetings to discuss cognitive development, social skills, and temperament. Presentations focused on the effects of visual impairment on these various areas of development with general suggestions for compensation. General stimulation activities were suggested, but no individualized treatment plans or activities were provided.

After each presentation by a professional, parents were given time to ask specific questions and discuss issues of concern to them. These sessions also functioned as a support group, whereby parents with older children who were visually impaired offered support and information to the parents of younger children.

Treatment Verification

The following procedures were used to verify that treatment was implemented as intended.

Collection of attendance data. Parent and child participation in the individual sessions, as well as parent involvement in group meetings, were recorded according to length of session and staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance (e.g., child illness, vacation etc.). Attendance data are summarized in Table 2.6 for subjects included in Posttest #1. These data indicate that the high intensity, weekly intervention group received almost nine times the number of intervention hours received by the low intensity group. In addition to the differences and number of hours of intervention received, the type of intervention was substantially different. In the high-intensity group, each hour of intervention included individualized, specifically focused developmental activity; whereas in the low-intensity group, the

Table 2.6

Treatment Verification Data for LSU/VI Intensity Study: Report of Services Received Between Pretest and Posttest #1

Variable	Low Intensity $\bar{x}$	Low Intensity (SD)	Low Intensity n	High Intensity $\bar{x}$	High Intensity SD	High Intensity n	P Value
• Average length of intervention in months	12.7	(2.0)	17	12.3	(.5)	14	.46
• Total number of hours of intervention	3.4	(3.9)	16	29.2	(8.8)	13	.00
• Intervenor's rating of parent involvement with intervention (range 0 to 45)	N/A	N/A	N/A	31.8	(6.1)	12	---
• Receipt of additional therapeutic services outside of assigned intervention							
% receiving no Speech/Language therapy	94%		17	69%		14	.41
% receiving no motor therapy	88%		17	69%		14	.38
% receiving no daycare	44%		17	77%		14	.03
% receiving no preschool	94%		17	69%		14	.28
• Evaluation of intervenors (range 0 to 30)	24.2		17	26.0		12	
• Parent satisfaction with services (range 0 to 4)	3.7	(.5)	7	3.7	(.5)	12	.84

hour of intervention consisted of general discussion around issues such as developmental milestones and facilitative strategies. Consequently, each hour of intervention in the high-intensity group was much more likely to produce effects than the intervention in the low-intensity group. Thus, the study closely resembles a treatment versus no-treatment comparison.

Parent report of time. Various strategies were used to measure parent report of time spent working with their child for those in the weekly intervention. However, accurate information was difficult to obtain, primarily due to the naturalistic learning and teaching approach of the program. Since the intervention in the high-intensity group stressed incidental learning activities to be integrated into the parent and child's daily routine, a discrete measure of time was not meaningful. Therefore, in lieu of a parent report of time, the intervenors rated the parents using a 9-item, 5-point Likert-type scale on their ability to integrate program suggestions at home. Examples of behaviors rated include the parent's ability to facilitate communication, encourage child to use functional vision, respond appropriately to child's initiation. The mean score for the high intensity group reflected moderate to good ability of parents to integrate home activities (see Table 2.6). Since parents in the low intensity group were not expected to be involved in incidental teaching with their children, and no instructions were given to them as to how to be involved in such teaching, no measures were taken on this variable for the low intensity group.

Additional services. Given this treatment intensity design, it is important to document any additional services that subjects may have received. There were few, if any, other services available, if parents were able to pay for them, in the study's geographical area designed to specifically treat children who are visually impaired. However, there were other services available for children with developmental delays. Parents could have accessed motor and/or communicative disorders specialists, though this is expensive. The Children's Hospital also provided such therapies to families who were receiving public assistance. Although there were other infant programs, these did not specialize in serving children with visual impairments. Parents were not restricted from obtaining additional services, though it was unlikely that many such services would be obtained given the lack of opportunities. The completion of the additional service form, described in the treatment verification section, provided the necessary information needed to monitor additional services.

Parents provided information via an interview with the assessment supervisor regarding any services that may have been obtained outside of the research program between Pretest and Posttest #1. Based on these data, few subjects received a substantial amount of additional therapeutic services (see Table 2.6). Subjects in the high intensity group reported the receipt of significantly more preschool or daycare hours. In many cases, it was difficult to differentiate center-based daycare from a preschool program. If these services are combined, 60% of children in the low intensity group had no daycare/preschool, and 54% of the children in the high intensity group had no daycare/preschool; this makes the two groups highly comparable.

Additional services data were also collected between Posttests #1 and #2. Many of the subjects turned three years of age after Posttest #1, and no longer participated in the original birth-to-three intervention to which they were assigned. Additional services data are only relevant for subjects under three years of age for the purpose of determining any contamination of the two interventions in question.

Information on subjects given between Posttest #1 and Posttest #2 indicates that subjects in the high intensity group averaged slightly more additional services (see Table 2.7). It is worthwhile to note that the percentage differences represent few subjects. One high intensity subject received speech and language therapy. The differences in the daycare percentage (83% versus 67%) translates to one more high

Table 2.7

Treatment Verification Data for LSU/VI Intensity Study:
Receipt of Additional Services Outside of Assigned Intervention Between Posttest #1 and Posttest #2

	Low Intensity			High Intensity			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
• Receipt of additional therapeutic services outside of assigned intervention							
% receiving no Speech/Language therapy	100%		6	83%		6	.41
% receiving no motor therapy	83%		6	83%		6	.38
% receiving no daycare	83%		6	67%		6	.03
% receiving no preschool	83%		6	50%		6	.28

intensity subject. There were three high intensity subjects and one low intensity subject involved in a preschool program. Again, it appears the overall differences between groups receiving additional services is not significant.

Parent satisfaction. Given the important role that parents play in receiving services and providing intervention to their children, rating scales were developed to record parent's satisfaction with the services they are receiving based on their group assignments as well as the service provider's impression of the parents' levels of knowledge, attendance, and support. Both forms are completed at posttest time. All obtained information was kept confidential. As shown in Table 2.6, parents from both groups report high satisfaction with the intervention in which they participated.

Evaluations of intervenors. To assist in determining the quality of the intervention, ratings and rankings of the interventionists from both groups were conducted internally by program supervisors, as well as externally by the project site coordinator and an independent reviewer. The program supervisors provided information about the quality of the intervention via a 5-point rating scale in the areas of skills, problem solving, work habits, relationships, communication, and attitude. The average score for the intervenors in the high intensity group was 24.2, from a possible total 30 points. There was only one intervenor in the low intensity group, and she received a total score of 26 out of 30. All intervenors were then compared to professionals in similar positions and rated in either the top 10%, top 25%, top 75%, or bottom 25%. Four of the six intervenors in the high intensity intervention were rated in the top 10%, and the remaining two were rated in the top 25% of their peers. These results reflect a quality program as viewed by staff at the Human Development Center.

In addition to these measures of treatment verification, a formal on-site review was conducted in December, 1988, by the site coordinator. Based on observations of home intervention sessions, reviews of records, and interviews with staff, the program was providing the services as required for the study. A detailed report is available for more specific information.

Dr. Kay Alicyn Ferrell, a well-respected authority on serving young children with visual impairments, provided an independent assessment of the program's ability to meet the unique needs of this population. This independent evaluation occurred in October, 1989. Dr. Ferrell rated the program highly in the area of general assessment procedures, supplementing standardized testing with observations of the child in the natural environment. She noted that attention to functional vision assessment and orientation and mobility assessment could be improved. She also suggested that more attention be given to the development of formal lesson plans and data collection, although the intervenor's records did provide good anecdotal information. IFSP development was rated as meeting all the criteria of a high-quality plan, and overall interaction with parents was viewed very positively. Dr. Ferrell stated that she was favorably impressed with the competencies of the staff in early childhood special education, even though they were not certified teachers of the visually impaired. Unfortunately, this dearth of trained specialists is a problem throughout the country.

Dr. Ferrell noted that the intervenors have done an admirable job, and were serving visually impaired infants and their families far better than some agencies with trained specialists. Dr. Ferrell stressed that the presence of professionals certified in visual impairment alone does not necessarily equate to an appropriate early intervention program. Expertise in early childhood development and family intervention may be of greater importance to an intervention such as this. The evaluation report in its entirety is available for review upon request.

Cost of Alternative Interventions

Analysis of the cost data for the LSU VI project reflects the per child costs for the individualized, weekly home-visit intervention versus the low intensity parent group intervention. These data were collected in June of 1988 and are adjusted for inflation to 1990 dollars. The total cost at discount rates of 3% and 5% are presented at the bottom of Table 2.8. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time. Since there had not been any major changes in the interventions, cost data were not collected each subsequent year.

Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). As shown in Table 2.8, each alternative used varying amounts of the indicated resources. The following sections describe the resources and costs used for the weekly home visit program and the parent group meetings.

Table 2.8

Cost per Child for LSU-VI Site (1990 Dollars)

Resources	High Intensity (n=15)	Low Intensity (n=15)
1. **UNDISCOUNTED**		
Agency Resources		
Direct services	$3 942	$ 269
Administration		
program	1,620	175
university	702	60
Occupancy	321	9
Equipment	125	9
Transportation	108	0
Materials/supplies	79	20
Telephone	75	1
Sub Total	$6,272	$ 543
Contributed Resources		
Direct services	0	16
Parent time	234	232
Parent transportation	428	115
Sub Total	$ 662	$ 363
Total	$6,934	$ 906
2. **DISCOUNTED (3%):**		
Agency Resources	$6,854	$ 592
Total Resources	7,577	989
3. **DISCOUNTED (5%):**		
Agency Resources	$7,261	$ 627
Total Resources	8,027	1,048

Totals may not add up due to rounding errors.

High intensity, weekly home-visit intervention. Salaries and benefits for direct service and administrative personnel were determined according to their FTE devoted to this aspect of the project. Direct service personnel included two teachers, an occupational therapist, a speech therapist, a physical therapist, a social worker, a developmental pediatrician, and a temporary home-based teacher hired for three months on a consulting basis. Administrative personnel included the program director, the principal, and a secretary. University administration was calculated using the LSU indirect rate of 12.6% for general, departmental, and sponsored projects administration. Parent time was required for participation in home visits, special sessions with the therapists, and for programming assessments. The opportunity cost of parent time ($9/hour) was applied to the average time (23.2 hours) each parent spent on the project in 1987-88. However, the actual value of parent contributions is probably much higher in this program than it appears since the majority of parent contribution was involved via incidental teaching strategies that are difficult to measure quantitatively. Thus, the actual estimation of value of parent time is most likely an underestimate of what the parents actually contributed. Occupancy charges, including space, maintenance, utilities, and insurance costs, are based on office leasing costs in the area. Nine dollars per square foot was applied to the 478 square feet used by the program (also pro-rated according to FTE). Annual equipment cost was determined by taking inventory of all instructional materials, office furniture, and equipment. Market replacement values were then applied to each item, costs were annualized accounting for interest and depreciation, and pro-rated according to the percent FTE worked on the project. Staff travel was based on actual mileage (at $.21 per mile) for home visits. Several parents were reimbursed for travel to the center for weekly intervention services. For parents who were not reimbursed, information was collected via telephone interview on the number of trips made to the center, the round-trip distance, and the approximate time spent in travel. Parent transportation costs were then calculated based on $.21 per mile and the opportunity cost of parent time ($9/hour) spent in travel. The cost of materials, supplies, and telephone charges were assessed based on actual usage of these items.

Low intensity, parent group meetings. Direct service costs for the low intensity parent group meetings involved compensation for the group leader on a contractual basis. Various professionals assisted the group leader in addressing specific topics on a volunteer basis. The opportunity cost of their time was determined at $25 per hour for 9 hours. Program administrative cost included a small portion of the site liaison's FTE. University administrative cost was based on the indirect rate as explained above. Parent costs included time spent in the group meetings (based on average attendance), as well as time and expenses associated with travel to the meetings (parent travel information was obtained for this group also by telephone interview). Occupancy cost, calculated at $9 per square foot, (for 47 square feet, pro-rated according to usage by the program) was calculated for the group meeting room at the LSU Eye Center and the site liaison's office. Equipment costs for the group meetings include instructional/curricular materials (Reach Out and Teach) and office equipment and furniture which was valued, annualized, and pro-rated according to FTE. Finally, telephone and materials and supplies costs were assessed based on annual actual usage.

Data Collection

Data on children and their families was collected using instruments selected to yield descriptive information (i.e., demographics) as well as assess treatment effects. The majority of the instruments were similar to those used in other Longitudinal Study sites. However, additional posttest data were collected using complementary measures selected to meet the unique characteristics of this visually impaired population. A description of diagnostician requirements is described below, followed by descriptions of the pre- and posttest instruments for this study.

Recruitment, training, and monitoring of diagnosticians. All testers recruited for the study successfully completed the certification process required for administration of the Battelle Developmental Inventory. From the beginning of the study in 1987, through 1989, testers were recruited through the Human Development Center (HDC) at Louisiana State University. As of January, 1990, testers were recruited from the Special Education Department at the University of New Orleans. All of the diagnosticians had bachelor's or master's degrees and extensive experience assessing infants and children with disabilities. All the testers were naive to the subject assignment. Shadow-scoring was conducted on 10% of the BDI administrations, averaging 93% interrater agreement. While working with the HDC, an assessment supervisor with a master's degree in special education coordinated the scheduling of the testing, collected the family measures, and ensured the quality of the test results via tester reliability checks and double-checking protocols. Since 1990, Dr. David Slade, a professor with the Special Education Department, has fulfilled the role of assessment supervisor.

Pretest. After children were identified and assigned to groups based on their visual acuity and screening results, a core pretest battery of measures used across all sites consisting of the Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III), were administered. (Specific psychometric information regarding these measures can be found in the EIEI 1986-87 annual report.) Demographic information was also obtained via interview with the parent. These measures were considered as potential covariates in the analysis as well as to investigate whether certain types of families or certain types of children profit more from intervention.

The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the Human Development Center in New Orleans, ensuring that the testing setting was the same for all subjects.

The family measures were completed by the parent attending the testing session following the administration of the BDI. Married parents and those with spouse equivalents were also given a copy of the FSS to take home for their partner to complete. To encourage and reinforce parent participation in the assessment process, parents were paid a monetary incentive of $20 for completing the pretest battery. The diagnostician scored the BDI and completed a testing report. The diagnostician did not score the family measures. All data were then transmitted to the assessment supervisor. The assessment supervisor maintained copies of all of the protocols for the on-site records and submitted the original protocols via certified mail to the EIRI site coordinator within one week.

Posttest #1. Core Posttest measures were collected after children were in the program for 12 months. These consisted of the Battelle Developmental Inventory and the family measures previously described.

Complementary measures included the Early Intervention Developmental Profile (EIDP) (Brown, et al., 1981) the Carolina Record of Individual Behavior (CRIB) (Simeonsson, 1981), Assessment of Preferential Looking, and videotaped assessment of parent-child interaction.

The EIDP is a criterion- and age-referenced instrument that assesses all major areas of development for children ages birth to 36 months. This instrument was selected for two reasons. The behaviors measured by the EIDP emphasize sensorimotor intelligence based on Piaget's theory of development, thus providing a different perspective on the child's development compared to the Battelle. Second, the EIDP contains a large quantity of items (299) which are broken down into small age ranges of approximately 3 months each. Thus, the EIDP would potentially provide a more sensitive measure of developmental progress. The EIDP was supplemented with the Preschool Developmental Profile, a version of the EIDP designed for use with children ages 3-6 years of age. This supplement was used with older subjects who did not reach a ceiling on the Early Intervention version. In such circumstances, raw scores were calculated by crediting full points possible on the EIDP and adding any additional points received on the preschool version. The EIDP manual reports validation studies which reflect strong concurrent validity with other standardized measures (i.e., Bayley), as well as strong interrater and test-retest reliabilities (Rogers & D'Eugenio, 1982).

The EIDP was administered in conjunction with the BDI, with identical items being scored based on the child's BDI performance and unique items being administered following the BDI administration. A separate diagnostician, also naive to subject assignment, administered the EIDP.

The Carolina Record of Individual Behavior (CRIB) was completed on each child based on the BDI diagnostician's clinical impressions when administering the EIDP. The CRIB qualitatively assesses variables that relate to the child's interaction with the environment, a key focus of the high intensity intervention in this study. Such variables include the child's responsiveness to other people and objects, participation with others, reactivity to stimulation, attention span, motivation, and endurance. Additionally, ratings of the child's negative and positive affective behaviors and exploratory behaviors were obtained. The psychometric properties of the CRIB reflect sound test-retest and interrater reliabilities, as well as some degree of construct validity (Simeonsson et al., 1982).

Forced Preferential Looking (Teller, Morse, Boston, & Regal, 1974) was conducted at both pre- and posttest time through the LSU Eye Center. During testing, the child was shown stimulus displays containing black-and-white gratings of different spatial frequencies (stripe width). The child's attention to the grating was observed, and monocular as well as binocular acuity estimates were obtained. This method of assessing acuity has been proven to be effective with infants as young as one month of age (Dobson et al., 1986). The pretest preferential looking test was used to stratify according to acuity for group assignment. Preferential looking was also conducted as a posttest measure. Since acuity is one critical variable in the assessment of functional vision, posttest assessments were conducted to assist in judging the effectiveness of the intervention increasing the child's functional use of vision. The preferential looking procedure was a standardized procedure, unlike most functional vision assessments which are non-standardized with a great deal of variability in administration procedures and results.

Videotaped assessment of parent-child interaction was used to measure the effects of visual impairment on parent-child relationships. This was considered to be an important outcome given the dramatic differences in the two treatments being compared. Standardized procedures recorded in a laboratory setting were developed. The videotapes were then sent to coders who have developed systems judged to be sensitive to the desired treatment variables. The Parent-Caregiver Involvement Scale (Farran, Kasari, Comfort, & Jay, 1986), rates maternal behavioral descriptors on a 5-point scale across three dimensions: amount, quality, and appropriateness. Global ratings of (1) availability of parent to child, (2) general acceptance and approval manifested by parent, (3) general atmosphere, (4) enjoyment, and (5) provision of learning environment. The Parent-Child Behavioral Observation System (Marfo, 1989) examines behavior as a dynamic process, measuring both child and parent behaviors and how they interact. Approximately half of the Year 1 posttest parent-child interaction videotapes have been coded and analyzed using the Parent-Child Behavioral Observation System. These measures provide information which is useful in establishing the comparability of the two intervention groups as well as providing information that can be used as covariates in the analysis. Additionally, it can be used to investigate whether certain types of families or children benefit more from the intervention procedures. To date, all of the children who have completed Posttest #1 have been videotaped; scoring of the tapes is proceeding, with only a limited number of scores now available.

Posttest #2. The posttest measures used during Year 2 include the BDI and the previously described family measures. Complementary measures include the assessment of preferential looking and two videotaped assessment procedures. The previously-described videotaped assessment of parent-child interaction was also collected during Year 2 posttesting. In addition to assessing group differences, this measure was repeated with the intention of providing insight into the impact of a visual impairment on later parent-child interactions.

A standardized videotape procedure for assessing exploration and play was also used for Posttest #2. Both exploration (the skills used to obtain information about novelties in the environment) and play (involving the application of information obtained through exploration) are outcome measures that are not assessed through traditional assessments, and yet are behaviors that have been closely related to cognition, language, and social development. Learning through exploration and play are strategies emphasized by the high-intensity, weekly intervention group. The Play Assessment Scale (Fewell, 1986) was used to analyze the exploration/free play videotaped scenarios.

By the time of Posttest 2, many families had relocated out of the original catchment area, making it difficult for families to come to a central testing area. For this reason, the location of some families necessitated testing in their homes. However, testers made every effort to ensure that there was a structured atmosphere.

Posttest #3. The posttest measures used during Year 3 include the BDI and the previously described family measures. Additionally, the Vineland Adaptive Behavior Scales were selected to obtain a more detailed estimate of the child's ability to function independently. The items on the Vineland tend to be less vision-oriented; in fact, norms for children with visual impairments are provided. The parent-child interaction data was continued, with age appropriate toys added. To date, 18 children have received Posttest #3 battery, as per their date of enrollment in the study. Due to the lack of complete subject data, these results will not be reported until October 1991.

Results and Discussion

The following section presents results of the study with respect to comparability of the groups on pretest measures, and the findings regarding the effects of alternative forms of intervention on measures of child and family functioning. To date, the results only pertain to the findings based on Posttest 1 and Posttest 2.

Comparability of Groups on Pretest Measures

Table 2.9 presents comparability of groups for whom Posttest #1 data have been collected, and Table 2.10 compares those for whom Posttest #2 data have been collected. In reviewing scores of subjects for whom Year 1 posttest data have been collected, BDI pretest scores are higher for the low intensity group, though these differences only approach significance for the gross motor subdomain (p = .06). (DQ scores are reported in the tables to provide insight into the subjects' developmental functioning; however, analysis was based on raw scores). In comparing the scores on the family measures between groups, the mean FRS score was significantly lower (p = .02); therefore, the FRS was considered as a covariate in the analyses of posttest data.

Differences between groups on Battelle pretest scores are consistent in comparing subjects included in Year 2 posttest analysis, with the high intensity group again scoring lower. On the family measures, subjects in the high intensity group again scored significantly lower on the Family Resource Scale. All other family measures reflected comparable scores for the two groups. The selection of covariates when analyzing Year 2 posttest results reflects these differences in scores for the low and high intensity groups.

Table 2.9

Comparability of Groups on Pretest Measures for NO/VI Intensity Study: Subjects Included in Posttest #1 by August 1, 1990

	Low Intensity				High Intensity					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• Age in months at pretest	14.5	(10.0)		17	13.1	(12.5)		14	75	-.14
• **Battelle Developmental Inventory (BDI)**[+]										
DQs for:										
Personal Social	76.8	(.3)		17	72.9	(.3)		14	44	-.30
Adaptive Behavior	66.4	(.4)		17	54.8	(.4)		14	31	-.36
Gross Motor	86.6	(.2)		17	67.9	(.3)		14	06	-.65
Fine Motor	66.3	(.3)		17	55.2	(.2)		14	29	-.38
Motor Total	77.8	(.2)		17	68.2	(.3)		14	10	-.57
Communication	78.5	(.3)		17	55.9	(.3)		14	33	-.37
Cognitive	59.9	(.3)		17	45.3	(.3)		14	23	-.40
TOTAL	74.3	(.3)		17	55.4	(.3)		14	24	-.43
• **Parenting Stress Index (PSI) Percentile Rank**[@,#]										
Child Related (range 47 to 235)	102.4	(22.5)	60	17	100.6	(16.6)	57	14	81	+.08
Other Related (range 54 to 270)	120.9	(17.5)	50	17	114.9	(17.8)	40	14	36	+.34
TOTAL (range 101 to 505)	223.3	(34.2)	53	17	216.1	(29.4)	43	14	54	+.21
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[#,*]										
Adaptation (range 0 to 26)	4.3	(4.1)		17	4.9	(2.5)		14	65	-.15
Cohesion (range 0 to 30)	4.3	(3.5)		17	5.5	(3.0)		14	32	-.34
TOTAL (range 0 to 80)	6.9	(4.2)		17	7.8	(2.9)		14	52	-.21
Discrepancy	9.0	(5.6)		17	10.4	(7.8)		14	58	-.25
• **Family Resource Scale (FRS)**[&,%]	131.6	(10.2)	74	17	117.3	(18.4)	48	14	02	-1.40
• **Family Index of Life Events (FILE)**[$,#]	7.9	(5.3)	55	17	10.4	(5.9)	40	14	24	-.47
• **Family Support Scale (FSS)**[&,%]	28.3	(11.5)	52	17	28.6	(10.4)	53	14	93	-.03

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "age equivalent" (AE) scores reported in the technical manual for each child's raw score by the child's chronological age at time of testing and multiplied by 100.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[#] Statistical analysis and effect size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with children with disabilities).

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

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Table 2.10

Comparability of Groups on Pretest Measures for NO/VI Intensity Study: Subjects Included in Posttest #2 by August 1, 1990

	Low Intensity				High Intensity					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• Age in months at pretest	14.9	(10.1)		15	13.8	(12.8)		13	.80	-.11
• **Battelle Developmental Inventory (BDI)**[+]										
DQs for:										
Personal Social	76.6	(.4)		15	73.8	(.3)		13	.47	-.29
Adaptive Behavior	69.9	(.3)		15	52.8	(.4)		13	.32	-.38
Gross Motor	86.5	(.2)		15	65.4	(.3)		13	.06	-.68
Fine Motor	69.9	(.3)		15	54.9	(.2)		13	.27	-.42
Motor Total	79.4	(.3)		15	67.3	(.3)		13	.10	-.60
Communication	83.1	(.3)		15	54.1	(.3)		13	.30	-.41
Cognitive	64.0	(.3)		15	47.3	(.3)		13	.21	-.43
TOTAL	77.6	(.3)		15	55.0	(.3)		13	.24	-.45
• **Parenting Stress Index (PSI) Percentile Rank**[@,#]										
Child Related (range 47 to 235)	101.0	(18.8)	57	15	100.8	(17.3)	57	13	.98	+.01
Other Related (range 54 to 270)	118.7	(17.5)	46	15	115.4	(18.5)	40	13	.63	+.19
TOTAL (range 101 to 505)	219.7	(32.3)	48	15	216.8	(30.5)	44	13	.81	+.09
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[*,#]										
Adaptation (range 0 to 26)	4.8	(4.1)		15	4.8	(2.6)		13	.97	.00
Cohesion (range 0 to 30)	4.2	(3.3)		15	5.5	(3.2)		13	.30	-.39
TOTAL (range 0 to 80)	7.1	(4.1)		15	7.8	(3.0)		13	.64	-.17
Discrepancy	9.6	(5.5)		15	10.5	(8.1)		13	.72	-.16
• **Family Resource Scale (FRS)**[&,%]	131.5	(9.8)	74	15	118.0	(19.0)	50	13	.03	-1.38
• **Family Index of Life Events (FILE)**[$,#]	8.6	(5.2)	47	15	10.2	(6.1)	40	13	.47	-.31
• **Family Support Scale (FSS)**[&,%]	29.9	(11.2)	59	15	28.1	(10.5)	51	13	.66	-.16

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "age equivalent" (AE) scores reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[#] Statistical analysis and effect size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently 645 families with children with disabilities).

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

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In reviewing posttest scores of subjects for whom Year 1 posttest data have been collected, BDI pretest scores are higher for the low intensity group, though these differences only approach significance for the gross motor subdomain (p = .06). In comparing the scores on the family measures between groups, the mean FRS score was significantly lower for the high intensity families (p = .02); therefore, the FRS was considered as a covariate in the analyses of posttest data. Differences between groups on Battelle pretest scores are consistent when comparing subjects included in Year 2 posttest analysis, with the high intensity group again scoring lower. On the family measures, subjects in the high intensity group again scored significantly lower on the Family Resource Scale (p = .03). All other family measures reflected comparable scores for the two groups. The selection of covariates when analyzing Year 2 posttest results reflects these differences in scores for the low and high intensity groups.

Subject attrition. Five subjects dropped prior to the collection of Year 1 posttest data. Three subjects were dropped from the study based on the parent's decision to no longer participate. One subject was disqualified based on the severity of other disabilities. One subject died following prolonged hospitalization. Thus, there were 31 active subjects at Posttest 1. One additional parent dropped by Posttest 2, and one subject could not be located; thus, there were 29 active subjects at Posttest 2 time.

Data for key demographic and pretest variables for those who remained in the study and those who dropped out of the study prior to the collection of Posttest #1 data are reported for children in each group in Table 2.11. As can be seen, those who dropped out from each group are quite similar to those who remained, except for the income variable. Since so few children have dropped out of the study, the test of statistical significance is not particularly meaningful, even though it is recorded in the table. These data seem to suggest, however, that attrition which has occurred thus far has not substantially effected the results of the study.

Table 2.11

New Orleans VI Intensity Study Attrition Comparison

		Group						ANOVA				
		Low Intensity			High Intensity			Group		Study Status		Group by Status
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES*	p Value	ES*	p Value	p Value
CA at Pretest	IN	15.2	(9.6)	16	14.1	(12.5)	13		.62		.17	.47
	OUT	3.5	(.7)	2	9.8	(8.8)	4					
Total PSI	IN	224.4	(35.0)	16	210.4	(21.1)	13	.29	.97	.18	.80	.31
	OUT	213.5	(12.0)	2	228.5	(32.9)	4					
Education Mother	IN	13.1	(1.8)	16	12.8	(2.7)	13	-.09	.92	.29	.52	.70
	OUT	12.0	(0.0)	2	12.5	(1.7)	4					
Education Father	IN	13.4	(3.0)	13	13.1	(3.4)	11	-.14	.53	.48	.49	.67
	OUT	13.0	(1.4)	2	11.5	(1.0)	4					
Income	IN	$24,500	($17,585)	16	$28,885	($27,910)	13	-.01	.56	.55	.37	.33
	OUT	$22,250	($17,324)	2	$ 9,500	($ 4,950)	4					
FRS	IN	131.9	(10.5)	15	111.3	(22.6)	13	-.49	.03	.13	.20	.79
	OUT	140.5	(5.0)	2	124.3	(21.7)	4					
Hours Daycare	IN	3.5	(3.9)	13	1.6	(2.9)	11	-.60	.02	-.56	.06	.12
	OUT	12.0	(17.0)	2	2.5	(5.0)	4					
BDI Total DQ	IN	73.0	(26.2)	16	60.0	(27.3)	13	-.39	.98	.71	.11	.33
	OUT	63.0	(53.0)	2	69.2	(36.0)	4					

* Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the x scores, divided by the standard deviation of the Low Intensity Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

Effects of Alternative Forms of Intervention on Measures of Child Functioning

Data are presented for children who have received testing immediately following one year of intervention followed by children who have been tested two years from the date of pretest. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Results of Posttest #1. Table 2.12 summarizes the posttest data for both low and high intensity subjects who have received the prescribed intervention for one

Table 2.12

Posttest #1 Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES
• Average length of intervention in months		12.7	(2.0)		17	12.3	(.5)		14		.46	-.20
• Age in months at posttest		27.9	(9.9)		17	26.1	(13.4)		14		.67	-.18
• **Battelle Developmental Inventory (BDI)**	1,2,3											
Personal-Social		80.4	(30.7)	71.3	17	62.6	(27.9)	71.8	14	.00	.94	+.02
Adaptive Behavior		51.3	(15.2)	46.5	17	44.0	(16.0)	48.8	14	.35	.56	+.15
Fine Motor		26.9	(11.4)	23.9	17	21.1	(9.0)	24.1	14	.00	.95	+.02
Gross Motor		48.8	(10.9)	45.5	17	35.2	(11.7)	38.5	14	5.8	.02	-.64
Communication		42.6	(17.5)	36.7	17	34.5	(14.5)	39.5	14	.19	.67	+.16
Cognitive		30.0	(13.9)	26.2	17	25.4	(13.9)	29.2	14	.54	.47	+.22
TOTAL		279.9	(94.6)	251.0	17	222.9	(89.0)	251.8	14	.00	.97	.00
• EIDP	1,2,3											
Gross Motor		69.6	(18.0)	65.0	17	53.8	(13.3)	58.4	14	3.18	.09	-.37
Fine Motor		36.4	(18.1)	32.5	17	27.8	(12.2)	31.7	14	.03	.86	-.04
Self-Care		38.8	(13.7)	34.9	17	32.8	(12.0)	36.7	13	.34	.57	+.13
Cognitive		37.2	(16.6)	33.0	17	25.8	(11.0)	30.0	14	.61	.44	-.18
Social		37.6	(13.2)	33.5	16	29.5	(11.5)	33.6	14	.00	.98	.00
Language		40.2	(15.6)	34.6	16	26.7	(14.0)	32.3	14	.63	.44	-.15
• CRIB	1,2,3											
Social Orientation[&] (range 0-9)		8.1	(1.3)	7.8	17	7.6	(1.6)	7.9	14	.03	.86	+.08
Participation[&] (range 0-9)		6.4	(2.0)	6.0	17	6.1	(2.1)	6.5	14	.32	.58	+.25
Reactivity[@@] (range 0-5)		5.3	(.9)	5.5	17	4.9	(.8)	4.7	14	5.2	.03	+.94
Attention[@@] (range 0-5)		5.6	(1.0)	5.6	17	5.7	(1.1)	5.8	14	.26	.62	-.20
Responsiveness[@@] (range 0-5)		5.1	(.4)	5.0	17	5.1	(.7)	5.1	14	.23	.63	-.23
Negative Affect[$] (range 0-16)		4.4	(3.3)	4.5	17	4.4	(3.9)	4.4	14	.01	.93	+.03
Positive Affect[&] (range 0-8)		4.4	(2.0)	4.3	17	2.7	(1.1)	2.8	14	4.9	.04	-.75
Exploration[&] (range 0-12)		1.3	(.5)	1.3	17	1.8	(.8)	1.8	14	4.34	.05	+.94
												$\bar{X}$ ES = +.08

Effect size (ES) is defined here as the difference between the groups (high minus low) on the $\bar{x}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores was based on raw score data.

[+] Analyses for the Early Intervention Developmental Profile are based on raw scores for the number of correct responses.

[&] Scores are based on a 9-point range with 1 as the most basic level and 9 the most advanced; therefore, high scores are best.

[@@] Scores are based on the "ideal" score reported in the manual. A score of "0" is best, and positive ESs indicate that the high intensity intervention group scored better.

[$] Covariates: 1 = BDI Gross Motor Raw; 2 = Family Resource Scale Raw; 3 = Chronological Age at Pretest

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year. As of August 31, 1990, data collection for Posttest #1 was completed on all active subjects. ANCOVA Fs, p values, and effect sizes are based on analysis of BDI raw scores.

Analyses of covariance were conducted for the BDI raw scores using the gross motor raw score and the Family Resource Scales, as these variables were different for the two treatment groups at pretest time and were highly correlated with outcome variables. Chronological age at pretest was also used as a covariate due to the high degree of variability and its correlation with the outcome measures. Analysis of the BDI posttest data show that the adjusted means for BDI adaptive, fine motor, and cognitive, domains were higher for the high intensity group. The total BDI score, personal/social, gross motor, and communication domain scores were lower for the high intensity group. However, none of these differences was statistically significant (at $p \leq .05$ level) resulting in very small positive effect sizes for the BDI domain scores, based on raw score differences.

The Early Intervention Developmental Profile scores are also reported in Table 2.12. Since this is a criterion-referenced measure, raw scores are reported for major domains using the Battelle gross motor raw score, the FRS, and chronological age at pretest as covariates. The low intensity group generally scored higher on all domains, except for self care. Again, none of these differences were statistically significant. Effect sizes generally favored the low intensity group.

Scores for the Carolina Record of Individual Behavior are reported for selected domains based on the ability to provide unique information as well as those most pertinent to the study. Scores for social orientation (reflects the child's responsiveness to persons in the environment), participation (describes the child's participation with the examiner), attention span (degree of persistence in attending to object, person, or activity), responsiveness to caretaker (degree of contact through eye contact, vocalizations, and/or touch), and negative affect (crying, avoidance, clinging) revealed no significant differences between groups. The high intensity group scored significantly better ($p \leq .05$) in the areas of exploration of objects using the senses (i.e., tactile via hands and mouth, olfactory) and reactivity (the ease with which the child is stimulated). The score for positive affect (laughing/smiling) was statistically significant ($p = .04$) in favor of the low intensity group. The mean effect size for Posttest #1 child outcome variables was negligible at +.08.

Results of Posttest #2. As of August 1, 1990, 25 subjects have completed Year 2 posttesting. As mentioned in the treatment verification section, the degree of intervention has varied for subjects between Year 1 and Year 2 posttesting. Of the 12 subjects assigned to the high intensity intervention, 4 subjects continued to receive the prescribed intervention; 7 graduated from the program upon reaching 3 years of age, 6 of whom participated in preschool programs during the year and 1 subject who did not receive no intervention due to functioning within normal limits; 1 subject chose a different intervention program located in their home area. Of the 13 children assigned to the low intensity intervention, 5 continued to participate in the study, although their attendance at the group meetings was negligible; 8 of the 13 low-intensity intervention subjects have graduated from the study upon reaching 3 years of age, with 3 participating in a special education program, 2 subjects enrolled in a regular preschool, 1 enrolled in a Head Start program, and 2 received no intervention (again due to performance within normal limits).

Given the various types of interventions present within the low and high intensity intervention groups due to the exiting of subjects from the original intervention upon reaching age 3 years, it is difficult to draw a conclusion regarding two years of consistent intervention. Rather, the data in Table 2.13 reflect the long-term effects of one year of the prescribed interventions.

Table 2.13

Year 2 Posttest Measures of Child Functioning for Alternative Intervention Groups for NO/VI Study

		Low Intensity				High Intensity						
Variable	Covariates[&]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[~]
● Average time between Pretest and Posttest #2		26.1	(2.1)		13	26.8	(5.0)		12		.67	-.31
● Age in months at posttest		42.2	(10.0)		13	41.5	(14.0)		12		.90	.07
● Battelle Developmental[*] Inventory F (BDI)												
Personal/Social	1,2	117.9	(27.3)	109.0	13	108.3	(29.6)	117.3	12	.56	.46	.30
Adaptive Behavior	1,2	73.7	(18.6)	67.8	13	66.6	(17.2)	72.5	12	.47	.50	.25
Fine Motor	1,2	39.6	(11.9)	36.8	13	34.2	(10.6)	37.1	12	.00	.95	.03
Gross Motor	1,2	60.5	(8.4)	58.7	13	48.3	(11.3)	50.0	12	4.00	.06	-1.04
Communication	1,2	63.5	(19.6)	55.9	13	55.6	(24.2)	63.1	12	.91	.35	.37
Cognitive	1,2	50.2	(23.0)	43.2	13	40.3	(22.8)	47.3	12	.25	.62	.18
TOTAL	1,2	405.3	(100.0)	371.4	13	353.3	(105.4)	387.3	12	.20	.66	.16
● Developmental Play Age (In Months)	1,2,3	18.5	(4.5)	16.6	13	14.4	(6.3)	16.3	11	.01	.90	-.07

[~] Effect size (ES) is defined here as the difference between the groups (High minus low) on the x scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of effect size).

[*] Statistical analysis for BDI scores were conducted using raw scores.

[&] Covariates: 1 = Family Resource Scale; 2 = BDI Gross Motor Raw; 3 = Chronological Age at Pretest

Battelle pretest gross motor raw score and FRS pretest score were again used as covariates. In reviewing the BDI domain scores for Posttest #2, the mean domain and total scores were not significantly different, reflecting overall negligible effect sizes. The mean gross motor subdomain scores neared statistical significance (p = .06) in favor of the low intensity group.

The developmental play ages of children based on the videotapes of spontaneous, independent play are reported in Table 2.13. Adjusted mean scores for the two groups revealed no significant differences.

Results of Posttest #3. As of August 1, 1990, 18 subjects had received the Posttest #3 battery. Analyses of the data are being postponed until a larger number of subjects is tested. It is expected that the majority of Posttest #3 data will be collected by October, 1991.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Data are reported for one year and two years following enrollment. Previously-described procedures were again implemented in the selection of covariates.

Posttest #1. Table 2.14 represents results of analysis involving family functioning measures. One family declined to complete the measures, therefore data from the high intensity group included 13 rather than 14 subjects. Analysis of covariance was performed using pretest scores for BDI gross motor raw score and Family Resource Scale. No significant differences were found between groups on any of the family measures. However, there is a trend toward differences between groups on the adaptability domain of the FACES III, in favor of the high intensity group. In reviewing effect sizes based on the measures of stress, positive effect sizes resulted for the total score of the PSI, the FILE, and the FACES III. Negative effect sizes resulted for the FRS and the FSS total score.

Analysis of parent-child interaction videotapes. The Multi-pass scheme (Marfo, 1989) was implemented for the coding of the parent-child interaction tapes. Multi-pass was designed primarily to study the notion of maternal directiveness in relation to the responses of parent and child to one another. The behavior count section of Multi-pass utilizes an event-based coding system targeting four types of parental directive behavior: 1) turn taking control, 2) response control, 3) topic control, and 4) inhibitive/intrusive control. The system also allows for a close analysis of verbal directiveness. Videotapes were sent directly to the author of Multi-pass to ensure accurate coding. Analysis of the raw data was conducted by the EIEI site coordinator.

Table 2.14

Posttest #1 Measures of Family Functioning for Alternative Intervention Groups for NO/VI Intensity

		Low Intensity Group					High Intensity Group							
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj $\bar{x}$	%ile	n	ANCOVA F	p Value	ES[^]
● Average Length of Intervention		12.7	(2.0)			17	12.3	(.5)			14		.46	-.20
● **Parent Stress Index[#][@] (PSI)**														
Child Related Range (50 to 235)	1	107.2	(15.5)	109.7	75	17	109.5	(21.4)	107.0	70	13	.12	.73	+.17
Parent Range (47 to 270)	2	124.3	(24.2)	123.6	56	17	123.5	(20.9)	124.2	56	13	.00	.96	-.02
Total Range (101 to 505)		231.5	(30.7)	233.4	65	17	233.1	(38.7)	231.2	63	13	.02	.88	+.07
● **Family Adaptation and Cohesion Evaluation Scales (FACES)[*][#]**														
Adaptability Range (0 to 26)		7.3	(6.5)	7.0		16	2.8	(2.6)	3.2		13	2.93	.10	+.58
Cohesion Range (0 to 30)		4.3	(2.6)	4.8		16	4.2	(3.7)	3.7		13	.68	.42	+.42
Total Range (0 to 80)		9.0	(6.2)	9.3		16	5.6	(3.9)	5.4		13	2.7	.11	+.63
Discrepancy		11.1	(7.8)	10.5		16	8.2	(8.0)	8.8		13	.28	.60	+.22
● **Family Resource Scale (FRS)[&][%]**		129.6	(10.8)	123.3	59	17	113.4	(20.0)	119.7	50	13	.45	.45	-.33
● **Family Support Scale (FSS)[&][%]**		35.6	(9.4)	34.2	71	16	29.7	(8.4)	31.1	63	13	.69	.41	-.33
● **Family Support Scale # of Sources**		15.9	(3.1)	16.1		16	16.8	(2.4)	16.7		13	.24	.63	+.19
● **Family Index of Life Events (FILE)[#][$]**		7.2	(4.5)	7.7	55	17	10.1	(9.0)	9.6	40	13	.40	.54	-.42

[^] Effect size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a general discussion of the concept of effect size).

[♦] Covariates: 1 = BDI Gross Motor Raw Score; 2 = Family Resource Scale Raw Score

[$] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[#] Statistical analysis and effect size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with children with disabilities).

Multi-pass provides data on 40 specific behaviors; therefore, related variables were combined to reflect the four dimensions of parental directive behavior. Additionally, dimensions of child responsiveness were also developed by combining related behaviors.

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Table 2.15 reports the results of preliminary analysis of Multi-pass comparing the low versus high intensity groups. To date, 14 of the 31 Posttest #1 videotapes have been coded. Due to this small number of subjects, only t-tests are reported rather than analysis of covariance. Results show that the groups did not differ significantly in regard to turn taking control of parent (degree of balance in

Table 2.15

Year #1 Posttest Measures of Parent-Child Interaction for Alternative Intervention Groups for NO/VI Intensity Study

		Low Intensity				High Intensity						
	Covariates[&]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES[^]
MULTI-PASS[*]												
• Parent Behavior												
Turn-Taking Control[+]		1.64	(.4)		7	1.67	(.4)		7		.86	-.08
Response Control[+]		5.58	(1.9)		7	4.35	(1.6)		7		.21	+.66
Inhibitions/Intrusions[+]		.52	(.2)		7	.25	(.1)		7		.00	+1.60
Imperatives/Implied[+]		2.90	(1.1)		7	2.71	(2.7)		7		.68	+.18
Instructional Behaviors		4.43	(2.3)		7	3.82	(1.0)		7		.56	-.26
• Child												
Response Control[+]		.59	(.5)		7	.27	(.2)		7		.18	+.60
Compliance with Inhibitions		.32	(.2)		7	.17	(.1)		7		.13	+.65
Compliance with Directions		1.88	(.8)		7	1.46	(.8)		7		.33	-.55
											$\bar{x}$ ES =	+.35
CAREGIVER INVOLVEMENT SCALE												
• Average Rating												
Amount	1,2,3	2.9	(.6)	2.9	14	2.9	(.4)	2.9	11	.02	.90	0.00
Quality	1,2,3	3.6	(.8)	3.6	14	3.8	(.5)	3.8	11	.39	.54	+.25
Appropriateness	1,2,3	3.7	(.8)	3.7	14	3.8	(.6)	3.8	11	.13	.72	+.13
• General Impression												
Availability	1,2,3	4.0	(1.0)	4.2	14	4.0	(.9)	3.8	11	.69	.42	-.40
Acceptance	1,2,3	3.6	(1.2)	3.8	14	4.1	(.8)	4.0	11	.13	.72	+.17
Atmosphere	1,2,3	3.4	(.9)	3.5	14	3.9	(.8)	3.8	11	.34	.57	+.33
Enjoyment	1,2,3	3.4	(.9)	3.5	14	3.6	(.7)	3.5	11	.00	1.00	0.00
Learning Environment	1,2,3	3.2	(1.2)	3.2	14	3.4	(1.1)	3.4	11	.13	.72	+.17
Mean General Impression	1,2,3	3.5	(.9)	3.6	14	3.8	(.8)	3.7	11	.02	.89	+.11
											$\bar{x}$ ES =	.10

[^] Effect Size (ES) is defined here as the difference between the groups (high intensity minus low intensity) on the $\bar{x}$ score divided by the standard deviation of the Low Intensity Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for more general discussion of the concept of Effect Size).

[*] All scores reflect frequency of occurrences divided by number of minutes recorded.

[+] Higher scores associated with higher level of directiveness.

[&] Covariates: 1 = BDI gross motor raw score at pretest; 2 = FRS total; 3 = chronological age, pretest.

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participation between parent and child), response control parent (extent to which parent behavior is directed at attempting to get the child to respond), response control of child (extent to which child behavior is directed at attempting to get the parent to respond), frequency of parent imperative, embedded, implied directives, frequency of child's compliance with these directives, frequency of parent instructional behaviors (labels, expands, gives and requests information, models, and reinforces). There was a statistically significant difference between groups on the frequency of parental inhibitions and intrusions (verbal or nonverbal behavior directed at stopping the child from engaging in an activity or behavior that is not considered to be dangerous/undesirable, or imposing the parental agenda at the cost of the child's interests) in favor of the high intensity group ($p \leq .05$). However, it should be noted that this was a very low frequency variable, thereby diminishing its statistical significance. Associated with the frequency of parental inhibiting behaviors is the frequency of child's compliance with parental inhibitions. Mean scores for compliance in the high intensity group were lower (though not significantly so), most likely due to the lower number of parental inhibitions which were directed toward them.

Posttest #1 parent-child interaction tapes were also analyzed using the Parent/Caregiver Involvement Rating Scale (Farran et al., 1986). This scale is designed to assess the behavior of the caregivers (in this case, mothers) during play interactions. Behavior is rated in regard to the amount displayed, the quality, and the appropriateness of 11 behaviors: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control activities, directives given, relationship among activities, positive statements, negative statements, and goal setting. The scores reported reflect averages of the 11 behaviors. Amount was scored based on a 5-point Likert-type scale with a "3" being the most desirable score. As shown in Table 2.15, both groups received almost ideal scores in regard to amount of behaviors, with no difference between the groups. Quality and appropriateness were scored based on a 5-point Likert-type scale, with "1" being worst and "5" being best. As shown in Table 2.15, there were no significant differences between the groups in regard to quality or appropriateness of these behaviors. Both groups received higher than average scores in regard to quality and appropriateness.

The coders using the Parent/Caregiver Involvement Scale also rated his/her general impressions of the caregiver depicted in the videotape. This included availability of the parent to the child, acceptance of the child, general atmosphere of the interaction, amount of enjoyment between parent and child, and parent's provision of a learning environment. These characteristics are also scored using a 5-point Likert-type scale, with "1" being poor and "5" being best. Scores for both groups were in the moderate range, with no significant differences between groups. Finally, a mean general impression score was calculated, revealing a minimal effect size in favor of the high intensity group. The mean effect size for the Parent/Caregiver Involvement Scale was .10 ("amount" not included).

Posttest #2. The core family measures were again administered two years from date of pretest. The parents of one subject again refused to complete the family measures, therefore data on only 9 of the 10 subjects from the high intensity intervention were available for analysis. As depicted in Table 2.16, no significant differences were found between intervention groups on any of the family measures. However, there was a large negative effect size for the FILE; upon closer examination of the scores, it appears that the discrepancy is due primarily to one subject in the high intensity group who underwent major upheavals in her life.

Subgroup Analysis

A subgroup analysis was performed applying a two-way analysis of variance by intervention group and by severity of vision loss (acuity worse than 20/800 versus

Table 2.16

Year 2 Posttest Measures of Family Functioning for Alternative Intervention Groups for N.O./VI Intensity Study

		LOW INTENSITY GROUP					HIGH INTENSITY GROUP						[#]	
Variable	Covariate[δ]	$\bar{x}$	(SD)	Adj.x	%ile	n	$\bar{x}$	(SD)	Adj.x	%ile	n	ANCOVA F	p Value	ES[~]
Average time between pretest and posttest		26.1	(2.1)			13	26.8	(5.0)			12		.67	+.33
Parent Stress Index (PSI)[#@]	1,2													
Child Related (Range 50 to 250)	1,2	100.2	(11.2)	102.9	61	13	112.0	(19.6)	109.3	74	11	.71	.41	-.57
Parent (Range 54 to 270)	1,2	119.9	(16.4)	123.8	56	13	127.6	(21.0)	123.6	63	11	.00	.97	+0.01
Total (Range 101 to 505)	1,2	220.9	(23.1)	227.8	60	13	239.8	(36.6)	232.9	65	11	.13	.72	-0.22
Family Adaptation and Cohesion Evaluation Scales (FACES)[*]														
Adaptability (Range 0 to 26)	1,2	3.5	(3.8)	4.2		13	5.3	(3.2)	4.6		11	.05	.83	-0.11
Cohesion (Range 0 to 30)	1,2	3.8	(2.8)	4.7		13	5.8	(4.4)	5.0		11	.04	.85	-0.11
Total (Range 0 to 80)	1,2	6.0	(3.6)	7.2		13	8.3	(4.7)	7.0		11	.01	.93	+0.06
Discrepancy[*]	1,2	7.8	(5.8)	7.6		13	6.8	(4.1)	7.0		11	.05	.83	+0.10
Family Resource Scale (FRS)[&%]	1,2	132.6	(13.6)	125.1	63	13	120.6	(20.8)	127.4	67	11	.12	.74	+.17
Family Support Scale Total (FSS)[&%]	1,2	31.2	(8.4)	28.6	55	13	28.9	(11.6)	31.5	67	11	.41	.53	+.35
FSS Sources[%]	1,2	14.54	(2.7)	15.2		13	15.4	(2.7)	14.8		11	.10	.75	-0.15
Family Index of Life Events[*] **(FILE)**	1,2	6.5	(2.9)	6.7	62	13	10.4	(9.2)	10.1	40	11	.95	.34	-1.17
													$\bar{x}$ ES =	-.15

[δ] Covariates: 1 = BDI gross motor raw, 2 = Family Measures Scale.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

[@] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the difference from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

[~] A low raw score and/or a high percentile score indicates lower stress level, and a positive ES is more desireable. 1 = BDI Gross Motor Score; 2 = Family Resource Scale

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acuity better than 20/800), using Battelle DQ scores as dependent variables. No significant interactions were found between intervention and degree of vision loss. However, as would be expected, Battelle scores were influenced by degree of vision loss alone, with children whose acuity was worse than 20/800 receiving lower scores.

The effects of socioeconomic status on degree of child progress was also analyzed, applying a two-way analysis of variance by intervention and by income [income greater than $13,000 (the median income) versus income less than $13,000]. Results reflect a trend toward the high intensity group having a greater impact on BDI scores for families with incomes more than $13,000 compared to families of income less than $13,000; however, only one of the five domains (adaptive) reached a level of significance ($p \leq .03$).

Conclusions

Based on the results of data collected after 12 months of intervention, it appears that there are negligible effects due to the high intensity intervention on measures of child and family functioning. Although not statistically significant, small positive effect sizes resulted for the Battelle Developmental Inventory (on all but the gross motor domain) at Posttests #1 and #2. This positive trend was contradicted by the Early Intervention Developmental Profile at Posttest #1 and the Exploratory/Play Assessment at Posttest #2, for which negative effect sizes resulted. One significant difference did appear at Posttest #1 when assessing behaviors that are less developmentally-based (i.e., the CRIB); specifically, the high intensity group scored significantly better in regard to exploring with other senses, a skill that is important for children with visual impairments.

In regard to effects of alternative interventions on measures of family functioning collected at Years 1 and 2, the results are also equivocal. The high intensity intervention appeared to positively effect the family's overall functioning and level of satisfaction with their family life (based on FACES III scores), yet levels of stress and utility of external resources and supports were not positively changed. Future subgroup analyses may yield useful information regarding the effects of different interventions on families with particular characteristics.

Parent-child interaction may be a potentially sensitive method of assessing the effects of the alternative treatment; one that will provide information different from the other outcome measures. However, conclusions cannot be made based on the small number of subjects presently available for analysis.

Although the results of this study are only based on 31 children (a relatively small number of children for intervention studies such as this), it is important to note that most of the previous experimental studies of the effects of early intervention with children with visual impairments were also based on small numbers. The findings of this study are substantially different than those from previous studies; therefore, it is important to reiterate the reasons why discrepancies may have occurred.

First, this study was based on a randomized experiment; few of the previously mentioned studies involved a control group for comparison. Furthermore, this study used diagnosticians who were uninformed as to subject assignment to assess child outcome variables, and efforts were also undertaken to ensure that the expected treatments were delivered as planned. Therefore, the results may be attributed to the quality of the research design.

Second, the qualifications of the intervenors raise questions regarding their impact on the outcomes. Although the intervenors were supervised by someone with a Ph.D. in visual impairment, the direct intervenors were not certified to serve the visually impaired. These results lend support to those in the field of visual impairment that view the needs of children with visual impairments to be so unique that the absence of trained specialists is detrimental to their development.

However, as postulated by the study's independent reviewer, the mere presence of visually impaired, certified instructors does not guarantee quality early intervention services (Ferrell, 1990). The vast majority of certified VI personnel have received training focusing on school-age children and/or adults. The use of such certified instructors who lack the early childhood and family-focused training may be equally inappropriate. Currently, there is only one personnel development program in the United States which provides an emphasis in early intervention for children with visual impairments. The shortage of personnel with early childhood visually handicapped expertise is even greater than the scarcity of teachers certified to serve the visually impaired. Therefore, the high intensity intervention provided by this study, although perhaps not ideal, is not uncharacteristic of typical early intervention for children with visual impairments when the shortage of VI-certified personnel is considered. Studies comparing treatment provided by intervenors certified to serve infants and toddlers who are visually impaired versus the generic early childhood/special educator would speak to this specialized training issue.

Third, it may be that children who are visually impaired, even at this young age, need much more comprehensive intervention services. Perhaps to achieve substantial benefit, it is necessary to have intervention programs which deliver professionally mediated intervention several times weekly to the children, or supplement home visits with a center-based program. However, as demonstrated by this study, the cost of delivering high intensity intervention is nontrivial, and it is an issue which states will scrutinize.

A fourth possibility is that perhaps the focus of the intervention should change to provide primary support and assistance to the family rather than emphasize developmental therapy directed toward the child. Although the high intensity intervention in this study was consistent with what is delivered in most early intervention programs, it is possible that different findings may result through the application of completely different forms of interventions. Although Individualized Family Service Plans (IFSPs) were implemented, the intervention was primarily child-focused. Perhaps a more radical orientation to the strengths and needs of the family should receive the primary emphasis, with minimal direct child contact. More intervention focused on parenting skills and coping behaviors may meet the immediate needs of parents with infants and toddlers. It is worth reiterating that the parents in the high intensity group did not have the benefit of participating in a parent support group; such contacts may be critical to parents of children with a specific disability.

Conclusions cannot yet be drawn regarding the long-term effects of the high versus low intensity treatments. As of August 1, 1990, approximately two-thirds of the Posttest #2 and half of the Posttest #3 data have been collected. Thus far, there do not appear to be any significant differences between the groups as measured by the aforementioned instruments. However, it would be premature to conclude that neither of the interventions had an impact on later child and/or family functioning. As other studies have shown, effects of intervention often are not evident until longitudinal data have been collected (Infant Health and Development Program, 1990). It may be that families with young children during the first three years initially benefit from less intense general support and access to resources, and that the individualized developmental intervention shows it effects in later stages (i.e., the early school years). These are issues which will require extended research.

SMA/LAKE McHENRY PROJECT

Project #3

COMPARISON: Severely Handicapped Children--Once per week versus three times per week services.

LOCAL CONTACT PERSON: Dr. Alice Kusmierek, Coordinator, Interagency Project for Early Intervention.

EIRI COORDINATOR: Stacey E. McLinden, Ph.D., Assistant Professor, University of Wisconsin--Milwaukee

LOCATION: Flossmoor, Illinois (Chicago Suburb)

DATE OF REPORT: 4-8-1991

Rationale for Study

Although popular support for early intervention efforts has been strong, research on early intervention effectiveness has shed little light on important issues such as the relative effectiveness of various program intensities (White & Casto, 1985). The research base which has dealt with moderate to severe young children with disabilities is particularly sparse. It is only within the last 15 years, since the advent of P.L. 94-142, that children with significant impairments have been systematically included in early intervention programs (Bailey & Bricker, 1984). Thus, little is known about the optimal intensity of services to be provided to this group of children.

The implementation of P.L. 99-457 has focused attention on early intervention services in general and on services to infants and toddlers in particular. As states are developing plans to service the youngest population of children with disabilities, questions are being raised regarding the most appropriate types of services to be provided. Peterson (1987) has discussed seven specific decisions which must be made regarding the development of a service delivery program, including who will be the target of service (e.g., child, mother, father, both parents, family), at what age services should begin, what services should be provided, in what setting the intervention program will be provided, who will be the primary intervention agent, in what social context services will be provided (e.g. individual or group program), and which agencies will provide services.

Although certain aspects of service delivery will be determined by practical and political forces (i.e., decisions regarding the agencies through which services will be delivered will be made at a state level based on the ability of different state agencies to perform this role) decisions regarding other aspects of service delivery can be facilitated by the availability of research data on the effectiveness of various approaches. Such data are particularly important in light of the cost issues (i.e., the cost of human as well as monetary resources) which various approaches to service delivery entail. However, the overriding issue should be, and is, how the services which are provided to infants and toddlers and their families can maximize their development.

Decisions regarding the type of services to be provided are particularly important, as such decisions are directly related to both the cost of intervention as well as its effectiveness. Although a myriad of research questions on the relative costs and effects of different types of services can be asked, a very basic question is, "How many hours of service should be provided each week to maximize child and family functioning?"

According to Bricker (1986), one hour per week of individual services is a common service delivery model for children under age three, in either a home-based or center-based setting with the child and primary caregiver present. This model has face validity from both a cost and a practical perspective (i.e. it makes sense to provide a relatively low intensity of services to young children whose skill development needs are relatively restricted as a result of their age, as well as to recognize the parent's responsibility as a caretaker first and an intervention agent second). However, given the impetus of increased funding for infant and toddler services, the question of efficacy must be raised with regard to the appropriateness of such a relatively low intensity of service. A very important question is whether an increase in the frequency with which services are provided would result in greater gains in both child and family functioning?

Overview of Study

The purpose of this study was to address the question of the relative efficacy of different intensities of early intervention services for children with disabilities under age three. The study involved an experimental comparison of the costs and effects of serving children on either a one-hour-per-week or a three-hour-per-week basis. Three hours per week were selected as the greater level of intensity of services based on a number of factors. First, even a more intensive level of service must take into account the factors of child skill development needs as well as the parent's role in intervention. While 20 hours of individual services per week provides a very clear cut intensity comparison, it not only dramatically increases the parent's role as an intervention agent, but may be difficult to justify given the types of skills and rate of skill development expected of any child under age three. Costs of providing such services on an individual basis would also be exorbitant. One hour three times per week, however, represents a level of service which is more intense than once per week, yet is not so intense that the parent's role is changed or expectations for child gains are exceeded. It was hypothesized that three times per week services would not only maximize the opportunity to intervene with particular child skills, but would increase the opportunity for program staff to provide family-oriented services as specified by P.L. 99-457.

To examine relative effectiveness of once-per-week versus three-times-per-week services, a number of measures of child and family functioning were selected for this study. Some of these measures have been administered at pretest, one year, and again at two years following the child's enrollment in the study. Other measures were administered at the first or second posttest only. To assess intervention effects on the child, the Battelle Developmental Inventory (BDI) (Newborg et al., 1984) Bayley Scales of Infant Development (Bayley, 1969), Wisconsin Behavior Rating Scale (Song & Jones, 1980), and Scales of Independent Behavior (Bruininks, Woodcock, Weatherman, & Hill, 1984) were administered.

The BDI, which was administered at pretest and during each posttest year, was selected to assess the child's overall development as well as skill development in five domains of functioning: Personal/Social, Adaptive, Motor, Communication, and Cognitive. The BDI allows for direct assessment and observation of child skills as well as use of parental report. The scale was developed for use with children birth to 8 years of age, thus facilitating the assessment of children of different ages on a longitudinal basis. The Bayley Scales, which were administered at the one year posttest, were selected to provide a more fine-grained analysis of the child's cognitive and motor skills. The Bayley has also been used extensively in previous studies of early intervention; thus, their use would facilitate comparison of the results of this study to other work. The Wisconsin Behavior Rating Scale, administered at pretest and at one year posttest, is completed by a specialist or educator who is familiar with the child, and thus allows for another source of data to be used to assess child skill development. The Early Development Scale (ED) and Short Form (SF) of the Scales of Independent Behavior (SIB) were administered at Year 2 posttest to provide additional data on the extent to which interventions impacted the subjects' adaptive behavior. Both the SIB ED and SF were administered because there is evidence to suggest that the age scores obtained on these scales may be significantly different for this population (Goldstein, Smith, Waldrup, & Inderbitten, 1987).

A battery of instruments which would allow for the assessment of the effects of intervention on the mothers and fathers of subjects was also administered. These instruments were selected to address criticisms of previous research in which the focus of assessment was restricted to child outcome measures (Mott et al., 1986). The instruments selected for use in this study were based on reviews of the literature on expected family outcomes, and variables with the potential to mediate family outcomes, and thus included measures of parent stress, social support, resources, family functioning, and life events and changes. The specific instruments included the Parenting Stress Index (Abidin, 1986), the Family Support Scale (Dunst et al., 1984), the Family Resource Scale (Dunst & Leet, 1985), the Family Adaptability and Cohesion Evaluation Scales (Olson et al., 1985), and the Family Inventory of Life Events and Changes (McCubbin et al., 1983). The Comprehensive Evaluation of Family Functioning Scale (McLinden, 1988), a new scale developed to assess the impact of the child with a disability in the family, was also administered to both the mothers and fathers at Year 2 posttest.

Methods

Subjects

A total of 75 children who were served by 3 different early intervention programs in the Chicago suburbs were included as subjects. Sixty children were posttested at Year 1, 49 at Year 2, and 38 at Year 3. Recruitment, assignment to groups, and demographic characteristics of the subjects are described below.

Recruitment. Subjects were recruited from three intervention programs in the Chicago suburbs. The three programs--South Metropolitan Association (SMA), Lake-McHenry Regional Program (LMRP), and Southwest Cooperative Association (SW Coop)--

received funding from the State of Illinois Board of Education from July 1, 1985, through June 30, 1988, to conduct an evaluation of the effectiveness of expanding services to the birth to three population. All three programs had in the past provided once-per-week intervention services to children under age three. As a condition of receiving additional funding from the state, agreed to provide three-times-per-week services to a randomly assigned experimental group, while continuing to provide once-per-week services to other children.

Between January 1, 1986, and June 30, 1987, all children who were referred to any of these three programs were considered for inclusion in the study if they were 24 months of age or less and had either a diagnosed disability or demonstrated overall developmental delay of 65% or more. A determination of developmental delay was made through a multidisciplinary team assessment conducted by the program as well as through completion of the Wisconsin Behavior Rating Scale by the member of the team assigned as the child's case manager. The age cutoff was included to ensure that all children would have an opportunity to participate in at least one year of early intervention services before moving on to a preschool program operated by the public school system at age three. Referrals who met the criteria were informed of the nature of the research project by program staff and asked to participate in the study. The requirement of random assignment to groups, and the possibility of obtaining three-times-per-week services, was emphasized. It was made clear that a decision not to participate in the study would in no way influence their ability to access the once-per-week services typically provided by the program.

A total of 75 children and their families agreed to participate and were pretested as subjects in the study. Of these, 15 families dropped out of the research project before Year 1 posttest data could be collected, and an additional 11 subjects dropped out before completing Year 2 posttest, and 11 additional families did not participate in Year 3 posttesting. The most common reason for attrition before Posttest #1 was a move out of the area (8 subjects). Other reasons included death of the subject (2 subjects), refusal to participate in posttesting, (1 subject), or dissatisfaction with the frequency or nature of services provided. Attrition prior to posttest one across groups was relatively equal (7 experimental, 8 control).

There was an unequal proportion of subjects from the experimental group (8) who dropped after Year 1 posttest versus the control group (3). However, the reasons for attrition were similar across groups. Of the eight experimental group subjects who dropped, five moved and three refused to participate in testing. Of the three control subjects who dropped, two moved and one refused to participate in testing. This attrition did not affect the comparability of the groups on any pretest variable, and actually improved the comparability of the groups in terms of number of children with both parents living at home as well as the ethnic make up of the groups. In addition, although there was a statistically significant difference between mother's age at pretest and Year 2, it is not practically significant (e.g., there is no reason to believe that a mean age difference of 4.4 years for mothers would have statistically significant influence on the outcomes of the study) and was not found at Year 3.

Attrition between Posttest #2 and Posttest #3 was also equal across groups (5 expanded, 6 basic). Of the 11 subjects, 2 died, 1 moved, and 8 refused to participate in testing. Attrition did not appear to significantly affect the comparability of the groups at Year 3, except for a statistically significantly higher percentage of mothers in the expanded group who held technical/managerial positions or higher. However, as mother's education, hours worked per week, and total household income were not different across groups, this does not appear to be a difference of any practical significance.

A series of two by two ANOVA'S were conducted to determine whether there were any statistically significant group by subject status (i.e., subjects who dropped versus those that do not) interactions. The dependent variables for these analyses included mother's age, number of hours worked-father, BDI total raw score, PSI total score, number of parents living with child, mother's FSS total score, and FRS total score. A statistically significant interaction effect was found for the FRS total score only. Subjects who dropped out of the expanded intervention group had higher FRS pretest scores ($\bar{x}$ = 126.7) than did subjects who dropped from the basic intervention group ($\bar{x}$ = 106.0).

Assignment to groups. Subjects were entered into the study on a continuous basis as identified by the programs and randomly assigned to groups by the EIRI coordinator. Data on the subject's disability and/or developmental status as provided by the program and the parent's level of stress as determined by the parent's score on the Parenting Stress Index (PSI) (Abidin, 1986) were used to stratify the subjects prior to random assignment. (A more detailed description of the procedures utilized to randomly assign subjects can be found in the Base Period Report.)

Demographic characteristics. Data on the demographic characteristics of all subjects enrolled in the study, as well as subjects in the experimental and control groups who participated in Year 1, Year 2, and Year 3 posttesting, are presented in Table 3.1. The total sample can be characterized as predominantly Caucasian and middle class. Most subjects lived in two-parent households in which fathers were employed full time and mothers were the primary caretakers for the child.

Intervention Programs

The two intervention groups received very similar types of service, but differed with the frequency with which those services were provided, with the experimental

Table 3.1

Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	All Subjects Pretested							Subjects Included in Year #1 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention				Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Age of child in months at program entry	13.7	(6.0)	40	12.5	(6.3)	34	.41	13.6	(6.0)	31	12.4	(6.2)	29	.45	-.20
Age of mother in years	30.3	(5.8)	39	32.8	(4.9)	34	.05	30.2	(5.3)	31	32.8	(5.1)	29	.06	.49
Age of father in years	33.0	(5.7)	36	34.6	(6.8)	34	.29	32.8	(5.5)	28	34.8	(7.0)	29	.25	.36
Percent male*	.47	(.51)	40	.38	(.49)	34	.43	.52	(.51)	31	.38	(.49)	29	.29	|.13|
Years of education for mother	13.5	(1.9)	39	13.2	(1.7)	34	.51	13.6	(2.0)	31	13.0	(1.6)	29	.20	-.30
Years of education for father	14.0	(2.1)	36	13.7	(2.1)	34	.56	14.3	(2.0)	28	13.7	(2.1)	29	.28	-.30
Percent with both parents living at home	.69	(.47)	39	.91	(.29)	34	.02	.71	(.46)	31	.93	(.26)	29	.02	.35
Percent of children who* are Caucasian	.79	(.41)	39	.97	(.17)	34	.02	.83	(.38)	30	97	(.19)	29	.09	.39
Hours per week mother employed	10.3	(16.3)	39	6.7	(14.1)	33	.32	9.2	(15.5)	31	7.6	(14.9)	29	.68	-.10
Hours per week father employed	35.3	(15.4)	34	40.9	(9.7)	30	.09	37.0	(14.0)	26	40.8	(10.4)	26	.26	.27
Percent of mothers employed* as technical/managerial or above	.10	(.31)	39	.24	(.43)	33	.13	.13	(.34)	31	.28	(.45)	29	.16	.13
Percent of fathers employed* as technical/managerial or above	.35	(.48)	34	.36	(.49)	33	.93	.37	(.48)	26	.36	(.49)	28	.93	-.18
Total Household income	$25,166	($16,490)	36	$28,772	($14,017)	33	.33	$27,430	($16,989)	29	$28,553	($13,549)	28	.79	.07
Percent receiving public assistance	.23	(.43)	34	.22	(.42)	27	.91	.17	(.38)	29	.23	(.43)	22	.63	.27
Percent with mother as primary caregiver	.97	(.17)	34	.97	(.18)	31	.95	.96	(.19)	27	.96	(.20)	26	.98	.15
Percent of children in* daycare more than 5 hours per week	.13	(.37)	30	.04	(.19)	27	.19	.17	(.38)	24	.04	(.21)	22	.19	|.08|
Number of siblings	1.0	(1.1)	39	1.1	(1.0)	34	.71	1.0	(.75)	31	1.2	(1.0)	29	.24	.27
Percent with English as primary language	.92	(.27)	39	1.0	(.0)	34	.10	.9	(.30)	31	1.0	(.0)	29	.08	.24

(continued)

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* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0." Percentages are based on the number of valid cases.

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Table 3.1 (continued)
Comparability of Groups on Demographic Characteristics for SMA/Lake McHenry Project

	Subjects Included in Year #2 Analyses (Based on Pretest Demographics)								Subjects Included in Year #3 Analyses (Based on Pretest Demographics)							
	Basic Intervention			Expanded Intervention					Basic Intervention			Expanded Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Age of child in months at program entry	13.6	(6.1)	28	11.3	(6.0)	21	.28	-.38	14.5	(6.0)	22	11.2	(6.4)	16	.11	-.55
Age of mother in years	29.7	(5.3)	28	33.1	(5.2)	21	.03	.64	30.7	(5.4)	22	32.4	(4.8)	16	.32	.31
Age of father in years	32.3	(5.6)	25	34.4	(5.6)	21	.22	.38	32.5	(5.0)	21	33.8	(5.0)	16	.42	.26
Percent male*	15	(.51)	28	.38	(.50)	21	.42	|.18|	55		22	38		16	.31	30
Years of education for mother	13.7	(2.1)	28	13.2	(1.8)	21	.39	-.24	13.7	(2.1)	22	13.5	(1.8)	16	.73	-.10
Years of education for father	14.4	(2.0)	25	14.1	(2.2)	21	.62	-.15	14.5	(2.1)	21	14.8	(2.2)	16	.76	.14
Percent with both parents living at home	71	(.46)	28	90	(.30)	21	.09	.29	86		22	94		16	.48	.16
Percent of children who* are Caucasian	85	(.36)	27	95	(.22)	21	.24	.18	86		22	94.		16	.48	.16
Hours per week mother employed	9.0	(15.4)	28	7.2	(14.4)	21	.68	-.12	8.9	(13.4)	22	8.6	(16.1)	16	.95	-.02
Hours per week father employed	38.3	(12.6)	23	40.5	(11.5)	18	.57	.17	40.1	(10.1)	20	40.6	(12.7)	15	.89	.05
Percent of mothers employed* as technical/managerial or above	11	(.31)	28	29	(.46)	21	.11	22	9		22	38		16	**.03**	.64
Percent of fathers employed* as technical/managerial or above	30	(.47)	23	40	(.50)	20	.52	-.09	32		19	53		15	.21	.39
Total Household income	$27,403	($17,603)	26	$30,774	($14,157)	20	.49	.19	$30,713	($16,777)	21	$32,033	($15,020)	15	.81	.08
Percent receiving public assistance	15	(.36)	27	19	(.40)	16	.74	-.03	5		21	8		12	.69	.18
Percent with mother as primary caregiver	96	(.20)	25	95	(.23)	19	.85	-.02	95		20	93		14	.80	-.11
Percent of children in* daycare more than 5 hours per week	14	(.35)	22	06	(.25)	16	47	|.20|	17		18	7		14	.44	-.20
Number of siblings	1.0	(.8)	28	1.2	(1.0)	21	.23	.25	.91	(.75)	22	.93	(.85)	16	.91	.03
Percent with English as primary language	90	(.31)	28	100	(0.0)	21	13	.04	91		22	100		16	.23	.2[illegible]
Medical Expenses									$2,337	($3,212)	16	$2,736	($3,279)	14	.74	.12

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0." Percentages are based on the number of valid cases.

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group receiving three-times-per-week services and the control group receiving once-per-week services. The specific services provided are described below.

Basic intervention (once-per-week services). Children and primary caretakers in this group participated in a once-per-week contact with either an infant specialist (e.g., speech/language pathologist or occupational or physical therapist) or an early childhood special educator. While most contacts occurred at a center-based location, programs did allow the flexibility of conducting some of the contacts in the parent's home. Since the programs did not provide transportation to the children and their parents, the most common reason for providing a home visit was lack of transportation to the center. However, home visits were also provided when a particular teaching session could be most effectively accomplished in the home (e.g., when feeding or sleeping behaviors were of concern).

The content of the intervention sessions was directly related to the needs of the specific child and family as specified in the child's Individualized Education Plan (IEP). No specific curriculum was followed unless the individual specialist or educator found that doing so would meet the child and family's specific needs. Thus, the specialists and educators have a great deal of freedom in determining what was accomplished during the individual sessions. In general, there was a program expectation that the sessions would focus on improving child development in the domains of personal/social, adaptive, motor, language, and cognitive functioning, and that the sessions would also help parents to become intervenors for their child.

Another major goal of the sessions was to provide a forum for parents to discuss issues of concern to them and to help them adapt to the daily demands of caring for a child with a disability. During the first year of the project, funding from the Illinois State Board of Education allowed the programs to hold a number of inservices to provide staff with additional training in providing family-focused intervention services (e.g., Dunst, Trivette, & Deal, 1988). This training emphasized the importance of addressing parent-identified needs as well as strengths in an effort to empower parents to become capable of dealing with the demands of caring for a child with special needs rather than relying solely on professional helpers and helping systems.

Expanded intervention (three-times-per-week services). Children who were assigned to this group participated in three, one-hour contacts per week with a specialist or educator. The content and focus of the sessions were the same as that for the control group. The increased staff contact time allowed for a wider range of IEP goals to be addressed, and the more frequent contact allowed more parent concerns and issues to be incorporated into the treatment sessions.

Treatment verification. A number of procedures were used to verify that treatment was implemented as intended. Data for Year 1 are presented in Tables 3.2. and 3.3, and data for Year 2 are presented in Table 3.4. An examination of the attendance data in Table 3.2 indicates that even though percent attendance in the

Table 3.2

Treatment Verification Data for SMA/Lake McHenry Project for Year #1 Posttest

	Basic Intervention Group			Expanded Intervention Group					
Variable	$\bar{x}$	SD	n	$\bar{x}$	SD	n	ANOVA F	ES	P Value
Intervenor Rating of:*									
Parent Attendance	2.55	(.68)	31	2.62	(.56)	29	.20	.10	.65
Parent Knowledge	2.13	(.67)	31	2.48	(.57)	29	4.78	.52	.03
Parent Support	2.42	(.67)	31	2.76	(.44)	29	5.30	.51	.02
Parent Rating of Satisfaction^	24.2	(4.2)	31	23.7	(3.2)	29	.31	-.12	.58
Rating of Intervention+									
Quality of Session	19.9	(8.1)	29	16.1	(7.3)	26	3.20	-.47	.08
Ranking of Intervenor	1.1	(.4)	28	1.2	(.40)	26	-.23	.25	.63
Total # of Sessions Attended	26.9	(6.8)	31	63.7	(16.4)	29	132.6	5.41	.00
Total # of Sessions Offered	36.3	(4.8)	31	95.9	(13.5)	29	534.8	12.42	.00
Percent Attendance	74.1	(16.5)	31	66.8	(14.8)	29	3.25	-.44	.08

* Parents were rated in three areas (i.e., attendance, knowledge, and support) by the intervenor who worked with them most closely. Rating scale was 1 = low; 2 = average; and 3 = high

+ Videotapes of a typical intervention session were scored by independent raters as to how well best practices were followed. Highest possible rating was 32.

^ Parents rated their satisfaction with the program in 7 areas on a scale of 1 = poor, 2 = fair, 3 = good, and 4 = excellent.

Table 3.3

Additional Services and Child Health Data for SMA/Lake McHenry Project

Variable	N	One Time Per Week Group Percentage	N	Three Times Per Week Group Percentage
1. Additional Services			31	
a. Speech Therapy (Average)	29			
None		83.9%		79.3%
< 1 Hr. Week		6.5%		10.3%
1 Hr. Week		3.2%		6.9%
2 Hrs. Week		6.5%		3.4%
> 2 Hrs. Week			31	
b. Physical or Occupational Therapy	29			
None		67.7%		79.3%
< 1 Hr. Week		12.9%		6.9%
1 Hr. Week		9.7%		10.3%
2 Hrs. Week		6.5%		3.4%
> 2 Hrs. Week		3.2%		6.9%
		0.0%		
c. % Receiving Social Work Services		6.5%		17.2%
d. % Receiving Home Nursing Services		3.2%		10.3%
e. % Receiving Nutritional Services		9.7%		3.4%
f. % Receiving Respite Services		17.2%		22.6%
g. % Receiving Parent Services			25	
2. Child Health Over Past Year	23			
% With Seizures		9.7%		20.7%
% With Unusual Weight Gain or Loss		9.7%		3.4%
% With Infectious Diseases		3.2%		3.4%
% With Eye/Ear Problems		58.1%		51.7%
General Health				
Worse Than Most		16.1%		24.1%
Average		71.0%		69.0%
Better Than Most		12.9%		6.9%

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Table 3.4

Treatment Verification for SMA/Lake-McHenry Project for Year #2 Posttest*

Variable	Basic Intervention Group			Expanded Intervention Group			ANOVA F	ES	P Value
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n			
Intervenor Rating of Parents									
Attendance	2.6	(.79)	12	2.8	(.58)	14	.56	.25	.46
Knowledge	2.5	(.67)	12	2.9	(.27)	14	4.80	.60	.04
Support	2.6	(.51)	12	2.7	(.61)	14	.34	.20	.56
Parent Rating of Satisfaction	24.3	(2.6)	27	24.9	(2.5)	21	.50	.23	.48
Total Hours of Additional Therapy Services^	93.1	(128.8)	26	157.2	(190.6)	19	1.80	.50	.19
Total # of Sessions Attended	15.0	(7.8)	23	37.8	(24.2)	20	18.23	2.92	.00
Total # of Sessions Offered	19.9	(11.1)	23	53.4	(31.6)	20	22.75	3.02	.00
Percent Attendance	78.7	(14.4)	23	68.4	(19.1)	20	3.27	-.64	.08

* Only subjects who were still being served by the programs involved in the study by the end of the 1988-89 school year were rated by intervenors. Attendance data were collected on subjects until they turned 3 and thus were no longer eligible to participate in the program. Attendance data were not available for subjects who left the program after Year One posttest.

^ Based on the total number hours of speech, motor, social work, and respite services received between Year One and Year Two posttests.

basic intervention group was higher (although not statistically significant at $p \leq .05$) than for the expanded intervention group, the expanded intervention group participated in almost 2½ times as many intervention sessions than did the basic intervention group. These findings were similar in Year 2. As the data contained in Table 3.4 indicate, the expanded intervention subjects were offered and attended significantly more treatment sessions during Year 2 than did the basic intervention group subjects. However, during Year 2, percent attendance for the basic intervention group was significantly higher than for the expanded intervention group. This suggests that even when additional service hours are offered over time, children will attend these sessions less consistently than when less frequent services are offered.

The specialists or educators were also asked to rate each parent's attendance, knowledge, and support for intervention efforts. The ratings for Year 1 suggest that parent attendance was similar across groups, but that the expanded intervention group was significantly more knowledgeable and supportive of intervention efforts than was the basic intervention group. At Year 1, teachers reported parents of children in the expanded intervention group to be more knowledgeable but not more supportive than parents of children in the basic intervention group.

At Year 1 posttest, videotapes of a typical treatment session were also rated to determine the extent to which the intervention represented 'best practices.' The highest possible rating was 32. The results of group comparisons on these variables are contained in Table 3.2. Although there was a trend in the direction of a higher quality of intervention for the control group, the difference between groups on this variable was not statistically significant ($p \leq .05$). There was also no statistically significant difference in the ranking of intervenors by their supervisors, or in the parents' satisfaction with services.

During Year 1, the data were analyzed in order to determine the percentage of subjects accessing various levels of additional services. These data indicate that approximately 20% of subjects in each group accessed some form of additional services during the year. The data collected during Year 2 represent the actual number of hours of additional services accessed by subjects in each group. There was not a statistically significant difference between the groups on number of hours of additional services.

Cost of alternative interventions. Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time. Table 3.5 summarizes the average cost per child for 3 days per week versus 1 day per week in the SMA and the Lake McHenry locations. These two programs were used as the basis for the calculations since they serve the majority of the children included in the project.

Data Collection

All subjects were tested at program entry and then again after one, two, and three years of intervention. Data collection procedures are described below.

Diagnosticians. Two diagnosticians were hired to complete pretesting and Year #1 posttesting. These diagnosticians were not employed by any of the participating

Table 3.5

Costs per Child for SMA/Lake McHenry (1990 Dollars)

	1 x per week	3 x per week
1. UNDISCOUNTED COSTS:		
Direct Services	$2,293	$ 5,561
Administration	979	2,937
Facilities	210	631
Equipment	59	178
Materials/Supplies	83	251
Transportation	83	248
Utilities, Insurance, Miscellaneous	103	308
TOTAL	**$3,810**	**$10,114**
2. DISCOUNTED COSTS (3%):		
Total Resources	$ 4,163	$11,052
3. DISCOUNTED COSTS (5%):		
Total Resources	4,411	$11,708

* *Totals may not equal due to rounding errors*

programs, and were not informed of the purpose of the study or of the group assignment of the subjects. They were trained to administer the measures by staff of the Early Intervention Research Institute. Scheduling of subjects and monitoring of diagnosticians was coordinated by staff of the SMA program, who also had overall responsibility for coordinating the project for the State of Illinois. Six diagnosticians were used to complete Year 2 and Year 3 posttesting. All were graduate students in School Psychology at the University of Wisconsin--Milwaukee (UWM) who successfully met EIRI certification requirements for diagnosticians. Assessment coordination was the responsibility of Dr. McLinden at UWM.

Interobserver agreement was calculated for eight BDI administrations and two Bayley administrations. Mean percent agreement was 92.4% for the BDI, 94% for the Bayley Mental Scale, and 100% for the Bayley Motor Scale.

Pretest data collection. Pretesting was accomplished in two phases. The first phase of pretest data collection occurred at the time that parents consented to participate in the study. At that time, parents completed the Parenting Stress Index, and the educator or specialist assigned to the family's case completed the Wisconsin Behavior Rating Scale. These data were then used for stratification purposes during random assignment.

After the subjects had been assigned to a group, the diagnostician contacted the parent and scheduled a testing session to complete the remainder of the pretest battery, consisting of the Battelle Developmental Inventory (BDI), the Family Support Scale (FSS), Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and Family Adaptability and Cohesion Evaluation Scales (FACES III). Testing occurred at one of the program sites closest to the parent's home, although in some instances it was necessary to schedule testing at the home. Parents were paid $20 to participate in the approximately 1½ hour testing session. Most subjects were tested within two weeks of their assignment to groups.

Year 1 posttesting. Posttesting was scheduled 12 months after the date upon which the subject first entered services. However, the average amount of time between pre- and posttesting was less than 12 months, due primarily to delays in pretesting some of the children. The time between pre- and posttesting did not, however, differ significantly across groups.

The posttest battery consisted of a large number of child and family measures, which necessitated the scheduling of two separate testing sessions. The first session, which lasted approximately 1-3/4 to 2-1/4 hours and for which parents were paid $20, included the administration of the BDI, PSI, FILE, FRS, FSS, and FACES III. The second session, which lasted approximately 1½ hours and for which parents were paid $15, included the administration of the Bayley Scales of Infant Development, Parent Survey Form, Parent Report of Child's Health, and Parent Satisfaction with

Services. A videotape of an interaction session between the child and his/her primary caregiver was also made at this time. Each child's specialist or educator also completed the Wisconsin Behavior Rating Scale at the time of the Year 1 posttest.

Year 2 posttesting. Subjects were tested again two years after their initial program entry date. The posttest battery was administered in two sessions in a manner similar to Year 1 posttesting. Year 2 posttesting differed from Year 1 posttesting as follows: (1) The Scales of Independent Behavior replaced the Bayley Scales and the Wisconsin Behavior Rating Scale as a child outcome measure, (2) Fathers and mothers completed the Comprehensive Evaluation of Family Functioning Scale, and (3) Fathers completed the FSS and FACES III.

Year 3 posttesting. Subjects were tested again three years after their initial program entry date. The posttest battery was administered in only one session. Some of the parent forms (parent survey, satisfaction questionnaire, and health form) were sent to the parents to be completed before the testing session, and data on additional services were collected by the assessment coordinator in a phone call with the parent after testing had been completed. One other measure (teacher rating form) was completed by the child's current teacher. Other measures for Year 3 posttesting included the Child Behavior Checklist and the CEFF (completed by both mothers and fathers). Fathers also completed the FSS and FACES III.

Results and Discussion

Pretest Comparisons

Results of comparisons of the Expanded and Basic Services groups on the measures collected at pretest for all subjects as well as those subjects included in Year 1, Year 2, and Year 3 analyses are presented in Table 3.6. The p values presented in the table are based on one-way analysis of variance. An examination of these values

Table 3.6
Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	All Pretested Subjects									Subjects Included in Year #1 Posttest										
	Basic Intervention				Expanded Intervention					Basic Intervention				Expanded Intervention						
Variable	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANOVA F	ES[^]	P Value
● Age in months at pretest	15.4	(6.3)		40	13.7	(6.6)		34	.38	15.0	(6.1)		31	13.8	(6.3)		29	.57	-.20	.45
● Wisconsin Behavior Age	7.5	(6.9)		40	6.9	(6.4)		34	.69	7.3	(6.8)		31	6.4	(5.8)		29	.22	.13	.57
● Discrepancy Score	.54	(.29)		40	.57	(.27)		34	.71	.56	(.28)		31	.55	(.26)		29	.00	.04	.99
● Battelle Developmental Inventory (BDI)																				
Raw Scores for:																				
Personal Social	30.7	(16.4)		40	32.2	(17.5)		34	.70	30.4	(16.1)		31	31.6	(16.8)		29	.08	.07	.78
Adaptive Behavior	25.0	(13.5)		40	25.5	(13.6)		34	.85	24.0	(13.3)		31	25.2	(13.0)		29	.13	.09	.72
Motor	34.3	(26.1)		40	33.9	(24.2)		34	.95	32.9	(25.0)		31	32.0	(23.1)		29	.00	-.04	.99
Communication	16.4	(8.0)		40	17.5	(9.3)		34	.60	16.2	(7.9)		31	17.3	(9.3)		29	.25	.14	.62
Cognitive	14.8	(9.0)		40	15.6	(8.6)		34	.68	14.5	(9.0)		31	15.6	(8.3)		29	.23	.12	.63
TOTAL	121.2	(71)		40	124.8	(71)		34	.83	117.9	(69.2)		31	122.5	(67.7)		29	.07	.07	.80
● Parenting Stress Index[♠][♣] (PSI) Percentile Rank																				
Child Related (range 47 to 235)	116.9	(26.9)	86	40	109.1	(20.6)	74	34	.17	119.9	(28.0)	88	31	111.1	(19.9)	76	29	1.94	.31	.17
Other Related (range 54 to 270)	127.3	(22.8)	61	40	122.9	(30.3)	55	34	.48	128.4	(24.8)	63	31	124.8	(30.5)	58	29	.25	.15	.62
TOTAL (range 101 to 505)	244.2	(41.9)	75	40	232.0	(45.0)	70	34	.23	248.3	(44.0)	78	31	235.9	(43.9)	67	29	1.18	.28	.28
● Family Adaptation and[*][♠] Cohesion Evaluation Scales (FACES)																				
Adaptation	4.1	(3.6)		39	5.2	(3.3		34	.20	4.2	(3.8)		30	5.2	(3.5)		29	1.1	-.26	.30
Cohesion	5.5	(5.6)		39	6.0	(4.1)		34	.71	5.6	(5.8)		30	5.8	(3.8)		29	.01	-.03	.90
TOTAL	7.8	(5.5)		39	8.8	(3.6)		34	39	8.1	(5.6)		30	8.6	(3.5)		29	.19	-.09	.67
● Family Resource Scale[%][&] (FRS)	117.4	(24.9)	48	38	120.0	(16.0)	54	31	.61	120.1	(25.7)	54	29	118.0	(15.7)	50	27	.13	-.08	.71
● Family Index of Life[♠][δ] Events (FILE)	11.5	(7.8)	29	39	12.3	(7.3)	29	34	.63	10.9	(8.1)	34	30	12.6	(6.0)	24	29	.75	.21	.39
● Family Support Scale (FSS)[%][&]	29.6	(12.1)		38	28.8	(10.2)		34	.76	30.5	(12.9)	63	30	27.7	(9.4)	50	29	.91	-.22	.34

(continued)

[♠] Statistical analysis and Effect Size (ES) for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

[♣] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of "0" is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies (currently, 645 families with children with disabilities).

[δ] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the x̄ scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

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Table 3.6 (continued)

Comparability of Groups on Pretest Measures for SMA/Lake-McHenry Project

	Subjects included in Year 2 Posttest											Subjects Included in Year #3 Posttest										
	Basic Intervention				Expanded Intervention							Basic Intervention				Expanded Intervention						
Variable	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANCOVA F	ES^	P Value	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	ANOVA F	ES^	P Value
● Age in months at pretest	15.0	(6.4)		28	12.5	(5.6)		21	2.02	-.39	.16	15.8	(6.3)		22	12.4	(5.6)		16	2.88	-.54	.10
● Wisconsin Behavior Age	7.4	(7.1)		28	5.2	(4.1)		21	1.54	-.31	.22	8.8	(7.4)		22	5.5	(4.4)		16	2.57	-.45	.12
● Discrepancy Score	.54	(.3)		28	.52	(.2)		21	.09	-.07	.77	.60	(.3)		22	.54	(.2)		16	.40	-.2	[illegible]
● Battelle Developmental Inventory (BDI)																						
Raw Scores for:																						
Personal Social	30.4	(16.9)		28	28.1	(12.4)		21	.26	-.14	.62	33.9	(16.8)		22	28.2	(14.1)		16	1.23	-.34	.27
Adaptive Behavior	23.5	(13.6)		28	23.4	(9.3)		21	.00	-.01	.98	26.1	(13.8)		22	23.4	(10.0)		16	.42	-.20	.52
Motor	31.7	(25.9)		28	29.0	(17.0)		21	.17	-.10	.68	36.2	(27.3)		22	29.8	(19.2)		16	.66	-.23	.42
Communication	15.9	(8.3)		28	14.8	(6.9)		21	.25	-.13	.62	17.5	(8.3)		22	14.3	(7.0)		16	1.56	-.39	.22
Cognitive	14.2	(9.3)		28	14.5	(6.4)		21	.02	.03	.89	16.0	(9.0)		22	14.3	(6.9)		16	.37	-.19	.55
TOTAL	115.6	(72.1)		28	109.9	(48.1)		21	.10	-.08	.75	129.7	(73.5)		22	110.0	(53.4)		16	.83	-.27	.37
● Parenting Stress Index[♠♣] (PSI) Percentile Rank																						
Child Related (range 47 to 235)	120.9	(29.3)		28	115.0	(16.5)		21	.70	.20	.41	118.6	(30.1)		22	115.1	(17.6)		16	.17	.12	.68
Other Related (range 54 to 270)	125.9	(24.0)		28	128.0	(32.0)		21	.07	-.09	.79	123.4	(26.2)		22	128.2	(36.7)		16	.22	-.18	.64
TOTAL (range 101 to 505)	246.8	(45.5)		28	243.0	(41.2)		21	.09	.09	.76	242.0	(48.3)		22	243.3	(46.8)		16	.00	-.03	.93
● Family Adaptation and[*♠] Cohesion Evaluation Scales (FACES)																						
Adaptation	3.9	(3.8)		27	5.4	(3.8)		21	1.73	-.39	.19	3.2	(3.5)		21	5.6	(4.0)		16	3.57	-.69	.07
Cohesion	5.0	(5.3)		27	5.3	(4.0)		21	.04	-.05	.84	5.3	(5.6)		21	5.5	(4.2)		16	.01	-.04	.91
TOTAL	7.4	(5.3)		27	8.4	(3.9)		21	.54	-.19	.46	7.2	(5.4)		21	8.7	(4.3)		16	.82	-.28	.37
● Family Resource Scale[%&] (FRS)	120.5	(26.7)		26	116.9	(16.9)		21	.29	-.13	.59	123.8	(27.3)		20	115.7	(17.0)		16	1.08	-.30	.31
● Family Index of Life[♠δ] Events (FILE)	10.7	(8.6)		27	13.2	(6.2)		21	1.27	.29	.27	9.9	(6.6)		21	13.6	(6.5)		16	2.99	-.56	.09
● Family Support Scale (FSS)[%&]	29.3	(12.5)		27	26.9	(9.1)		21	.54	-.19	.46	29.6	(10.7)		21	27.6	(9.2)		16	.36	-.19	.55

[♠] Statistical analysis and Effect Size (ES) for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

[♣] A low raw score and/or a low percentile score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of "0" is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[%] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal studies (currently, 645 families with children with disabilities).

[δ] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

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indicates that, at pretest, experimental and control groups were not statistically significantly different on any of the measures of child or family functioning and that attrition did not significantly affect the comparability of groups at Years 1, 2, or 3.

Posttest Analyses for Year 1

Results of group comparisons on child outcome measures for Year 1 are presented in Table 3.7. Analysis of the data for the three measures of child functioning--BDI, Wisconsin, and Bayley Scales--indicated that there were no statistically significant differences between the groups after one year of intervention.

Table 3.7

Year 1 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}^*$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
Average Length of Time between Pretest & Posttest		10.7	(1.8)		31	10.5	(2.2)		29	.09	-.11	.76
Age in months at Posttest		25.7	(6.3)		31	23.9	(6.7)		29	1.17	-.28	.28
Battelle Developmental Inventory Raw Scores for:												
Personal/Social	BRSR	50.5	(26.1)	51.3	31	49.0	(23.0)	48.2	29	.90	-.12	.35
Adaptive Behavior	BABR	36.4	(17.3)	37.0	31	37.4	(14.5)	36.8	29	.02	-.01	.89
Motor	BMR	54.7	(31.2)	54.7	31	52.1	(26.6)	52.1	29	.53	-.08	.47
Communication	BCTR	26.6	(13.3)	27.2	31	27.4	(11.8)	26.7	29	.08	-.04	.78
Cognitive	BCR	22.6	(12.4)	23.2	31	23.7	(9.6)	23.1	29	.01	-.01	.92
Total	BTR	190.9	(97.9)	193.5	31	189.7	(81.6)	186.8	29	.46	-.08	.50
Bayley Scales												
Mental	RANW/BTR	104.3	(51.9)	106.5	31	112.5	(38.3)	110.1	29	.28	.07	.60
Motor	RANW/BMR	46.1	(23.0)	46.5	31	47.2	(18.0)	47.1	29	.06	.03	.81
Wisconsin												
Deviation Score	Pretest	.62	(.35)		31	.68	(.33)		29	.92	.17	.34
Behavior Age	Pretest	16.2	(10.6)		31	16.2	(9.5)		29	.60	.00	.44

Results of the group comparisons for the family outcome measures for Year One are presented in Table 3.8. Statistically significant group differences were found on the Family Support Scale Total Score and on the FACES III Cohesion score. Mother's FSS total score for adequacy of support was higher (p = .03) for the mothers in the expanded intervention than for those in the control group. This indicates that mothers who participated in services three times per week reported higher levels of helpfulness for available sources of support than did mothers who participated in services once per week. The FACES III Cohesion score for mothers in the expanded intervention group was lower than for the basic intervention group, indicating levels

Table 3.8
Year 1 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index**												
Child	PSIB	119.2	(20.6)	116.6	31	111.0	(22.8)	113.7	29	48	.15	.49
Parent	PSIC	128.0	(26.5)	126.6	31	131.0	(35.5)	132.4	29	1.08	.22	.30
Total	PSIA	247.2	(40.5)	242.3	31	241.9	(52.6)	247.1	29	.37	-.13	.55
• **Family Adaptation and Cohesion Evaluation Scales* III (FACES III) - Mother**												
Adaptability	ADAPT	4.7	(3.4)	4.4	31	4.9	(4.1)	4.9	29	30	-.15	.59
Cohesion	COHES	5.6	(3.9)	5.6	31	3.4	(3.4)	3.4	29	5.80	.56	.02
Total	FACET	8.0	(4.0)	7.7	31	6.7	(4.4)	6.7	29	.98	.32	.33
• **Family Resource Scale (FRS)**	FRS	119.0	(23.7)	117.1	31	121.0	(15.1)	123.2	29	2.54	.08	12
• **Family Support Scale (FSS) - Mother**	FSSAM	26.9	(10.2)	26.3	31	29.8	(10.4)	30.7	29	5.02	28	.03
• **Family Index of Life Events (FILE)**	FILE	10.3	(6.2)	11.0	31	11.1	(6.6)	10.6	29	13	13	.72

of family cohesion closer to the ideal for this variable. There were no statistically significant differences on any of the other family measures.

Videotapes of parent/child interactions were obtained for 62 subjects during Year 1. EIRI contracted with several researchers who had developed scoring systems for such videotapes in order to have them independently analyzed (Kofi Marfo, Gerald Mahoney, and Dale Farran). This arrangement ensured that the tapes would be analyzed by people who were thoroughly familiar with the scoring system being used and were uninformed about the group membership of participating subjects. Communication difficulties in such a long-distance scoring arrangement unfortunately resulted in some tapes not being scored in time for this report. However, enough results were available for several meaningful analyses.

The results of the Marfo analysis of the parent-child interaction are included in Table 3.9. Out of 35 variables tested, a statistically significant difference was found for only one--*Child Complies with Mother's Verbal Instruction*. This is no more than would be expected to be found by chance when so many variables are being

Table 3.9

Year 1 Posttest Analyses for Videotapes of Parent/Child Interaction Analysis for SMA/Lake-McHenry

	Basic Intervention Group			Expanded Intervention Group				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	Prob
• Parent verbal mand	4.1	(4.6)	26	3.9	(1.2)	25	.03	.87
• Parent nonverbal mand	.2	(.3)	26	.2	(.2)	25	.31	.58
• Parent verbal response	1.0	(.6)	26	1.1	(.4)	25	.49	.49
• Parent nonverbal response	.2	(.3)	26	.2	(.2)	25	.21	.64
• Parent verbal response mand	.2	(.3)	26	.2	(.1)	25	.16	.69
• Parent nonverbal response mand	0	(.0)	26	.0	(.0)	25	2.19	.14
• Parent verbal unlinked	1.9	(1.1)	26	1.7	(.6)	25	.21	.65
• Parent nonverbal unlinked	1.3	(.7)	26	1.3	(.4)	25	.34	.56
• Child verbal mand	.1	(.3)	26	.1	(.2)	25	.12	.73
• Child nonverbal mand	.1	(.2)	26	.2	(.2)	25	1.09	.30
• Child verbal response	1.3	(3.9)	26	.5	(.8)	25	1.03	.31
• Child nonverbal response	1.8	(.9)	26	1.9	(.6)	25	.16	.69
• Child verbal response mand	.0	(.0)	26	.0	(.0)	25	.96	.33
• Child nonverbal response manc	.0	(.0)	26	.0	(.0)	25	--	--
• Child verbal unlinked	.0	(.1)	26	.0	(.0)	25	.01	.90
• Child nonverbal unlinked	1.4	(.7)	26	1.5	(.5)	25	.21	.65
• Parent initiates topic	.9	(.5)	26	.9	(.2)	25	.01	.91
• Parent follows topic	.3	(.4)	26	.4	(.2)	25	.18	.67
• Child follows topic	.7	(.5)	26	.7	(.2)	25	.00	.94
• Child initiates topic	.4	(.4)	26	.5	(.2)	25	1.27	.26
• Parent verbal inhibition	.1	(.1)	26	.1	(.1)	25	1.69	.20
• Parent nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	.89	.35
• Parent intrusion (inadvertent)	.1	(.1)	26	.1	(.1)	25	1.41	.24
• Child complies with verbal inhibition	.0	(.1)	26	.1	(.1)	25	4.51	.04*
• Child complies with nonverbal inhibition	.1	(.1)	26	.1	(.1)	25	3.04	.09
• Parent standard imperative	1.8	(.8)	26	2.2	(.7)	25	3.56	.06
• Parent embedded/implied directive	.6	(.7)	26	.7	(.4)	25	.11	.74
• Child complies with standard imperative	.9	(.4)	26	1.0	(.4)	25	1.25	.27
• Child complies with embedded/ implied directive	.4	(.7)	26	.2	(.2)	25	.85	.36
• Parent labels	.4	(.2)	26	.4	(.2)	25	.06	.80
• Parent expands	.1	(.1)	26	.0	(.1)	25	.66	.42
• Parent gives information	.6	(.5)	26	.6	(.3)	25	.00	.97
• Parent requests information	1.5	(2.4)	26	1.2	(.7)	25	.29	.59
• Parent models	.7	(.3)	26	.8	(.5)	25	1.23	.27
• Parent reinforces	.4	(.3)	26	.3	(.3)	25	.07	.79

tested. The results of the Farran and Mahoney analyses of the parent/child interaction tapes are included in Table 3.10 and 3.11, respectively. There were no

Table 3.10

Year 1 Posttest Parent/Child Interaction Ratings by Farran for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
Variable	X̄	(SD)	n	X̄	(SD)	n	ANOVA F	P Value
AMOUNT								
1. Principal Involvement	2.9	(1.30)	21	3.2	(1.20)	18		
2. Verbal Involvement	3.5	(.68)	21	3.4	(.70)	18		
3. Responsiveness of Caregiver	3.2	(.81)	21	3.7	(.59)	18		
4. Play Interaction	3.6	(.92)	21	3.6	(.78)	18		
5. Teaching Behavior	1.2	(.44)	21	1.2	(.38)	18		
6. Control Activities	3.6	(.92)	21	3.7	(.90)	18		
7. Directiveness, Demands	2.8	(.89)	21	3.2	(1.00)	18		
8. Relationship Among Activities	3.9	(.77)	21	3.9	(.83)	18		
9. Positive Statements, Regard	2.2	(.99)	21	2.4	(.85)	18		
10. Negative Statements, Regard	1.9	(.89)	21	1.8	(.71)	18		
11. Goal Setting	1.6	(.92)	21	1.8	(1.00)	18		
12. Total for Amount	30.5	(3.78)	21	31.7	(4.80)	18	.76	.39
QUALITY								
1. Physical Involvement	3.7	(.77)	17	3.9	(.75)	17		
2. Verbal Involvement	3.8	(.51)	21	3.9	(.73)	18		
3. Responsiveness of Caregiver	3.8	(.75)	21	3.9	(.68)	18		
4. Play Interaction	3.8	(.70)	21	3.8	(.73)	18		
5. Teaching Behavior	3.8	(1.30)	5	3.8	(.50)	4		
6. Control Activities	3.8	(.77)	21	3.8	(.88)	17		
7. Directiveness, Demands	3.9	(.64)	20	3.6	(.79)	17		
8. Relationship Among Activities	3.3	(.85)	21	3.5	(.79)	18		
9. Positive Statements, Regard	3.7	(.46)	15	4.0	(.63)	16		
10. Negative Statements, Regard	3.8	(.83)	18	3.4	(.79)	12		
11. Goal Setting	3.9	(.60)	9	3.6	(.70)	10		
12. Total for Quality	32.7	(5.50)	21	32.4	(8.90)	18	.02	.89
APPROPRIATENESS								
1. Physical Involvement	4.1	(.43)	17	4.1	(1.2)	17		
2. Verbal Involvement	3.5	(.81)	21	3.7	(.58)	18		
3. Responsiveness of Caregiver	3.8	(.77)	21	3.6	(.62)	18		
4. Play Interaction	3.9	(.57)	21	3.9	(.83)	18		
5. Teaching Behavior	3.8	(.45)	5	4.0	(.82)	4		
6. Control Activities	3.6	(.75)	21	3.6	(.79)	17		
7. Directiveness, Demands	4.0	(.65)	20	3.9	(.56)	17		
8. Relationship Among Activities	3.3	(.72)	21	3.7	(.69)	18		
9. Positive Statements, Regard	4.3	(.59)	15	3.8	(.75)	16		
10. Negative Statements, Regard	3.8	(.73)	13	3.8	(.58)	12		
11. Goal Setting	4.0	(.71)	9	3.9	(.74)	10		
12. Total for Appropriateness	33.0	(5.40)	21	32.7	(8.80)	18	.03	.87
GENERAL IMPRESSION								
1. Availability	4.2	(.83)	21	4.4	(.71)	18	1.16	.29
2. Acceptance	4.1	(.70)	21	3.9	(.90)	18	.03	.86
3. Atmosphere	3.8	(.98)	21	3.6	(.70)	18	.04	.83
4. Enjoyment	3.5	(.68)	21	3.8	(.88)	18	1.70	.20
5. Learning Environment	3.4	(.93)	21	3.5	(.86)	18	.07	.79
AVERAGE RATINGS								
1. Amounts	2.8	(.34)	21	4.5	(6.9)	18	1.37	.25
2. Quality	3.7	(.52)	21	6.6	(11.9)	18	1.19	.28
3. Appropriateness	3.8	(.48)	20	4.9	(4.6)	18	1.16	.29
4. General Impression	3.8	(.67)	21	8.8	(21.3)	18	1.15	.29

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Table 3.11
Year 1 Posttest Parent/Child Interaction Ratings by Mahoney for Alternative Intervention Groups for SMA/Lake McHenry

	Basic Intervention			Expanded Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES
Affect	3.31	(.69)	31	3.24	(.56)	31	.71	-.09
Child Orientation	3.17	(.91)	31	2.85	(.76)	31	.16	-.36
Performance Orientation	2.99	(.75)	31	3.12	(.48)	31	.51	.17

statistically significant differences between the groups on any of the variables coded in these analyses. Thus, it does not appear that there are any meaningful differences at Year 1 between the two groups in terms of parent/child interaction as rated by Marfo, Mahoney, and Farran.

Subgroup Analyses for Year 1

To examine the relative effectiveness of once-per-week versus three-times-per-week services with a more homogeneous subsample of children with respect to overall delays, children whose primary disability was either a speech/language or motor delay (i.e., children whose cognitive functioning was not impaired) were excluded from the analysis of the posttest data. The results of this subgroup analysis are presented in Table 3.12. An examination of these data indicates that even with a more homogenous sample, the differences between the groups were similar to the full group. The only statistically significant difference found was in favor of the expanded services group on The Family Support Scale.

Posttest Analyses for Year 2

For one subject in the expanded services group, the family declined to have the child complete the measures of child functioning, but did complete the family measures. The results of the analyses of the child functioning measures for Year

Table 3.12

Year #1 Posttest for SMA/Lake-McHenry Project (Excluding Subjects With Speech/Language and Motor Impairments)

		Basic Intervention Group				Expanded Intervention Group						
Variable	Covariates&*	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	ANCOVA F	ES^	P Value
Chronological Age @ Posttest		25.7	(6.3)		31	23.9	(6.7)		29	1.17	-.29	.28
# of Months Between Pre- and Posttest		10.7	(1.8)		31	10.5	(2.2)		29	.09	-.11	.76
Battelle Developmental Inventory (BDI	BDI Prest raw scores	Adj.$\bar{x}$				Adj.$\bar{x}$						
Raw Scores*												
Personal/Social	P/S	50.5	(26.1)		31	49.0	(23.1)		29	.89	-.06	.35
Adaptive Behavior	Adaptive	36.4	(17.2)		31	37.4	(14.5)		29	.02	.06	.89
Motor	Motor	54.7	(31.2)		31	52.1	(26.6)		29	.53	-.08	.47
Communication	Comm.	26.6	(13.3)		31	27.4	(11.8)		29	.08	.06	.78
Cognitive	Cognitive	22.6	(12.4)		31	23.7	(9.6)		29	.01	.09	.92
TOTAL	Total	190.9	(97.9)		31	189.6	(81.6)		29	.46	-.01	.50
Bayley Scales												
Raw Scores												
Mental Scale	BTR	104.2	(51.8)		31	112.5	(38.3)		29	.61	.16	.44
Motor Scale	BTR	46.2	(23.0)		31	47.2	(18.1)		29	.00	.04	.95
Parenting Stress Index*	PSI Pretest											
Total Score	Total	247.2	(40.5)	78	31	241.9	(52.5)	84	29	.37	.13	.55
Child Domain	Child	119.2	(20.6)	89	31	111.0	(22.8)	87	29	.47	.40	.49
Parent Domain	Parent	128.0	(26.5)	65	31	131.0	(35.5)	76	29	1.08	-.11	.30
Family Support Scale*	FSS Pretest											
Total Score - Mother		26.9	(10.2)	45	31	29.8	(10.4)	57	29	5.03	.28	.03
Family Resource Scale*	FRS Pretest											
Total Score		119.0	(23.7)	46	31	121.0	(15.1)	55	29	2.54	.08	.12
FACES III*	FACES											
Discrepancy Score	DISC Pretest	9.8	(8.9)		26	11.8	(8.6)		24	.84	-.22	.37
FILE*	FILE Pretest	10.3	(6.2)	29	31	11.1	(6.6)	29	29	.13	-.13	.72
Wisconsin	Wisc Pretest											
Deviation Score*		.6	(.35)		31	.7	(.33)		29	.92	.17	.34
Behavior Age▲		16.2	(10.6)		31	16.2	(9.5)		29	.60	.00	.44

^ On those variables in which higher scores indicated more favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Control Group from the mean of the Experimental Group and dividing by the mean of the Control Group. On those variables in which higher scores indicate less favorable levels of functioning, the Effect Size was calculated by subtracting the mean of the Experimental Group from the mean of the Control Group and dividing by the mean of the Control Group.

* Wisconsin Deviation Score was computed by dividing the child's behavior age by the child's chronological age.

▲ Wisconsin behavior age reflects the child's age equivalent score.

* See Table 3.2 for additional footnotes.

3 for all other subjects are contained in Table 3.13. As was true for Year 1, there were no statistically significant differences between groups on any of the measures.

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Table 3.13

Year 2 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

Variable	Covariates	Basic Intervention Group (0)				Expanded Intervention				ANCOVA F	ES	P Value
		$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n			
Average length of time between Posttests 1 and 2	---	12.9	(1.3)		28	12.6	(1.8)		21	.79	.13	.38
Age in months at Posttest 2	---	38.8	(6.4)		28	36.1	(6.7)		21	2.02	.43	.16
• **Battelle Developmental Inventory (BDI) raw scores for:**												
Personal/Social	BPSR	78.0	(40.7)	75.9	28	74.4	(31.1)	77.4	20	06	.04	.80
Adaptive Behavior	BABR	48.0	(25.2)	47.8	28	48.7	(18.4)	48.9	20	.09	04	.76
Motor	BMR	62.1	(38.2)	60.7	28	63.0	(26.4)	65.0	20	.48	11	.49
Communication	BCTR	35.4	(23.2)	33.8	28	30.5	(16.8)	32.7	20	.10	-.05	.76
Cognitive	BCR	28.5	(18.9)	28.6	28	24.8	(12.5)	24.7	20	1.95	-.21	.17
Total	BTR	252.0	(140.5)	246.8	28	241.4	(97.1)	248.6	20	.01	.01	.92
• **Scales of Independent Behavior:**												
Early Development Raw	BABR	61.3	(31.5)	61.5	27	65.2	(22.6)	65.0	20	.27	.11	60
Short Form Raw	BABR	21.9	(14.8)	22.0	27	23.4	(10.8)	23.3	20	.26	.09	.61
Early Development Standard Score	BABR	54.1	(35.0)	54.2	27	53.6	(32.4)	53.3	20	.01	-.03	.92
Short Form Standard Score	BABR	65.5	(27.9)	65.6	27	69.8	(26.3)	69.6	20	.34	15	.56
• **General Health**	GENHLTH1	1.9	(.42)	1.9	27	1.8	(.48)	1.9	21	.01	.00	.91

The results of the analyses of the Year 2 posttest measures of family functioning are contained in Table 3.14. There was a statistically significant difference between the groups for Mother's Family Support Scale Score for adequacy of support. This is consistent with the findings for Year One. However, there was no statistically significant difference between the groups on the FACES III Cohesion score, as had been found in Year One. However, the Expanded Intervention group continued to have a more positive score on this variable than did the Basic Intervention group.

Table 3.14

Year 2 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake-McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	ES	P Value
• **Parenting Stress Index**												
Child	PSIB	121.6	(23.8)	120.0	28	114.3	(26.3)	116.4	21	39	15	54
Parent	PSIC	132.1	(26.8)	133.0	28	135.1	(40.2)	134.0	21	03	-.04	87
Total	PSIA	253.7	(45.9)	252.1	28	249.4	(62.0)	251.5	21	00	01	.94
• **Family Adaptation and Cohesion Evaluation Scales III (FACES III) - Mother**												
Adaptability	ADAPT	4.8	(3.3)	4.9	28	6.4	(4.2)	6.3	21	1.50	-.42	.23
Cohesion	COHES	5.4	(3.9)	5.5	28	3.9	(5.3)	3.8	21	2.27	.44	.14
Total	FACET	7.8	(4.3)	8.0	28	8.6	(5.2)	8.3	21	.08	.07	.78
• **Family Adaptation and Cohesion Evaluation Scales III (FACES III) - Father**												
Adaptability	EDUCF2	3.8	(3.1)	3.9	18	4.6	(2.4)	4.1	17	.46	-.06	.50
Cohesion	EDUCF2	4.1	(4.0)	4.2	18	4.4	(5.1)	4.8	17	.00	-.15	.99
Total	EDUCF2	6.2	(4.2)	6.4	18	7.2	(4.4)	7.0	17	22	-.14	64
• **Family Resource Scale (FRS)**	FRSA	119.0	(18.2)	117.7	28	120.1	(19.2)	120.8	21	38	18	.54
• **Family Support Scale (FSS) - Mother**	FSSAM	25.0	(9.1)	24.9	28	29.4	(10.7)	30.1	21	5.59	.58	.02
• **Family Support Scale (FSS) - Father**	FSSAF	29.4	(7.3)	29.9	19	28.6	(9.1)	29.6	17	01	-.04	.94
• **Family Index of Life Events (FILE)**	FILEA	9.6	(7.2)	10.4	28	10.8	(5.9)	10.0	20	.08	05	.78
Comprehensive Evaluation of Family Functioning												
• **CEFF - Mother**												
Total Frequency	EDUCM2	93.7	(27.9)	93.6	27	95.3	(19.8)	95.3	19	02	-.06	90
Total Problems	EDUCM2	7.3	(7.9)	7.1	26	8.1	(9.6)	8.3	19	14	-.15	.71
• **CEFF - Father**												
Total Frequency	EDUCF2	91.4	(25.7)	91.4	18	96.1	(16.2)	95.6	16	.36	-.17	.55
Total Problems	EDUCF2	6.4	(6.9)	6.4	18	7.7	(9.6)	5.2	15	12	18	.73

Posttest Analyses for Year 3

There were no statistically significant differences between the groups on any measures of child functioning (Table 3.15) at Year 3. On the measures of family functioning (Table 3.16), there was no longer a statistically significant difference on the Family Support Scale, although the mean score for this variable was still higher for the Expanded Group. There were no other statistically significant differences between the groups on any of the other family measures.

Table 3.15

Year #3 Posttest Measures of Child Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES
● Time Between Posttest #2 and #3		13.1	(2.0)	---	22	13.1	(1.7)	---	16	.00	.98	.00
● Age in Months at Posttest #3		53.1	(6.3)	---	22	49.4	(6.4)	---	16	3.16	.08	-.59
● Battelle Developmental Inventory												
Raw Scores for:												
Personal/Social	1	96.1	(43.6)	92.9	21	81.3	(34.1)	85.5	16	.50	.48	-.17
Adaptive Behavior	1	59.3	(27.8)	57.7	22	54.6	(19.9)	56.9	16	.02	.88	-.03
Motor	1	82.5	(48.9)	78.7	22	78.2	(32.8)	83.4	16	.27	.60	.10
Communication	1	49.8	(29.8)	46.6	22	34.3	(18.4)	38.7	16	1.69	.20	-.27
Cognitive	1	43.9	(27.2)	42.4	22	32.8	(15.4)	34.8	16	2.33	.14	-.28
Total Score	1	322.5	(166.0)	311.7	21	281.2	(113.6)	295.4	16	.26	.62	-.10
● General Health	1	2.0	(.5)	2.0	2	2.0	(.52)	2.0	16	.00	1.00	.00
● Child Behavior Checklist												
T-Score - Internalizing	---	54.7	(8.3)	---	22	54.6	(9.2)	---	15	.00	.97	.01
T-Score - Externalizing	---	48.5	(10.3)	---	22	51.9	(13.5)	---	15	.76	.39	-.33
T-Score - Total Problems	---	50.6	(10.3)	---	22	52.5	(11.3)	---	15	.28	.60	-.18

Covariates: 1 = Pretest Score used as Covariate

Table 3.16

Year #3 Posttest Measures of Family Functioning for Alternative Intervention Groups for SMA/Lake McHenry

		Basic Intervention				Expanded Intervention						
Variable	Covariates	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES
● Parenting Stress Index												
Child	1	114.0	(24.0)	113.2	22	115.4	(30.1)	116.4	16	.16	.69	-.13
Parent	1	124.3	(24.1)	126.2	22	137.1	(44.2)	134.6	16	1.79	.19	-.35
Total	1	238.3	(45.9)	238.8	22	253.2	(68.1)	252.5	16	1.23	.28	-.30
● FACES III - Mother												
Adaptability	1	3.9	(2.7)	4.4	22	5.5	(4.7)	4.8	16	.13	.72	.15
Cohesion	1	6.0	(4.4)	6.3	22	4.4	(4.1)	4.4	16	2.53	.12	.43
Total	1	7.8	(4.3)	8.2	22	7.8	(5.3)	7.3	16	.46	.50	.21
● FACES III - Father												
Adaptability	2	4.6	(3.6)	4.6	17	3.7	(2.3)	3.7	14	.59	.45	.25
Cohesion	2	4.4	(6.0)	4.0	17	4.0	(4.0)	4.5	14	.05	.82	-.08
Total	2	7.5	(5.8)	7.5	17	6.4	(3.2)	6.4	14	.39	.54	.19
● Family Resource Scale	1	121.4	(17.2)	118.3	22	118.9	(14.4)	121.4	16	.68	.42	.18
● Family Support Scale-Mother	1	25.3	(11.3)	24.7	22	30.2	(11.6)	31.0	16	3.96	.06	.56
● Family Support Scale-Father	2	28.9	(6.3)	28.9	17	30.1	(8.1)	30.1	14	.21	.65	.19
● FILE	1	9.8	(7.6)	11.3	22	10.5	(7.5)	9.1	15	1.07	.31	.29
● CEFF - Mother												
Total Frequency		92.9	(17.6)	---	20	91.2	(26.3)	---	14	.04	.83	.10
Total Problems		5.3	(6.9)	---	20	6.9	(9.7)	---	14	.29	.59	-.23
● CEFF - Father												
Total Frequency		94.4	(16.3)	---	15	98.1	(15.1)	---	14	.39	.54	-.23
Total Problems		5.6	(6.1)	---	15	4.9	(5.6)	---	14	.11	.74	.11

Covariates: 1 = Pretest Score used as Covariate; 2 = Father's Education used as Covariate

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The data from the teacher questionnaire (Table 3.17) indicate that there are no statistically significant differences between the groups in terms of current educational placement on time spent in various types of classrooms. The data presented in this table indicate that the large majority of these subjects are currently receiving special education services through, or more hours per day, in a self-contained special education classroom.

Table 3.17

Year 3 Teacher Ratings and Parent Satisfaction Data for Alternative Intervention Groups for SMA/Lake McHenry

Variable	Basic Intervention $\bar{X}$	Basic Intervention (SD)	Basic Intervention n	Expanded Intervention $\bar{X}$	Expanded Intervention (SD)	Expanded Intervention n	ANOVA F	P Value	ES
• Percentage of subjects currently▲ in special education	90.0		20	100.0		15	1.25	.22	-.25
• Percentage with 90-100% Attendance▲▲	85.0		20	71.0		14	1.21	.24	.30
• Teacher's recommendation for▲▲ placement for next year	1.9	(1.6)	18	1.6	(1.1)	15	.73	.47	-.19
• Teacher ratings for 15 items▲	36.1	(5.3)	20	37.9	(4.5)	15	1.16	.29	.34
• # of months child has attended current program	16.6	(7.8)	18	14.4	(9.5)	15	.51	.48	-.28
• # of Hours/Wk child attends current program	16.8	(9.9)	18	15.3	(7.9)	15	.24	.63	-.15
• % of time per week child spends in regular class	7.5	(24.5)	20	4.0	(15.5)	15	.24	.63	-.14
• % time per week child is in self-contained class	82.4	(32.3)	20	92.4	(22.9)	14	.98	.33	.31

▲ T scores are provided for these variables

▲ Higher scores for teacher recommendations indicate greater involvement in regular education program. Higher scores for teacher ratings indicate more desireable functioning.

Discussion

A few conclusions can be made about the relative effectiveness of once per week versus three times per week services given the longitudinal data presented for this population. First of all, it does not appear that increasing the number of service

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hours to three times a week has a significant effect on the skill development of a child with disabilities. Although there were three separate indices of the child's developmental level at Year 1, two indices at Year 2, and one at Year 3, there were no statistically significant differences between the once-per-week and three-times-per-week groups on any of these measures.

Although the interventions did not appear to differentially affect child skill development, there were indications that the three-times-per-week intervention had positive effects on perceived levels of support by mothers. The higher score for mothers' reported satisfaction with sources of support at both Years 1 and 2 lends credence to the assumption that three-times-per-week services allow for an increase in the amount of family support which programs can provide. The lack of a significant difference at Year 3 may be due in part to the smaller number of subjects tested, as the trend at Year 3 was similar to that found at Years 1 and 2.

Although the results of this study do not provide support for increasing service hours for purposes of improving child functioning, the observed effects of the increased level of services on mothers' perceptions of support must be considered. Based on the consistent effects of family functioning, but lack of effects on child functioning after two years of intervention, it might appear that the significant increase in the cost of providing three-times-per-week services versus once-per-week services may not be warranted. However, one hypothesis which might be presented is that the observed effects on parental support and resources might generalize to more profound outcomes such as a maintenance of parental marital status and willingness of the family to continue to maintain the child in the home. The longitudinal data to be collected in future years will be crucial in addressing these issues.

ARKANSAS INTENSITY STUDY

Project #4

COMPARISON: Children with Mild to Severe Handicaps--Home-based intervention once per week versus home-based intervention twice per week.

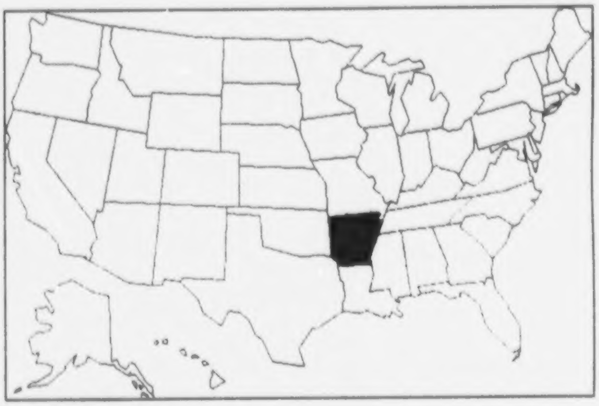
LOCAL CONTACT PERSONS: Lowell Collins, Coordinator (Sunshine Preschool); Janice Hardin, Ed.D., Coordinator (Richardson Center)

EIRI COORDINATOR: Chuck Lowitzer, Ph.D.

LOCATION: Bentonville, Arkansas, and Fayetteville, Arkansas

DATE OF REPORT: 4-8-1991

Rationale for the Study



Limited evidence in the existing literature is available to guide programming decisions concerning the relative effectiveness of various intensities of early intervention (White & Casto, 1985). The frequency and intensity with which early intervention services are provided varies across program models based largely on philosophical orientation and professional judgment of individual child needs. Although home-based early intervention models are widely used, there is unfortunately, little empirical evidence upon which to make decisions regarding the effects of varying the frequency with which such home-based services are provided. This study provides a comparison of the effectiveness of two levels of intensity of home-based services for children from birth to five years old.

Review of Related Research

Currently, parents and professionals often make decisions regarding the form services should take based only on their experience and/or philosophy of the human condition (Fredericks, 1985). Rarely are the program models, approaches, or curricular contents evaluated in a systematic manner (Switsky & Haywood, 1985). The field lacks empirical findings in many areas critical to the training and education of young children with severe disabilities. The treatment intensity issue is of particular importance in programs serving young children with moderate and severe disabilities because it is often assumed that because of their developmental needs such children need more intervention. Discussions about whether interventions should be more intensive inevitably also raise concerns about the costs associated with increased intervention.

Although research in this area is sparse (Bailey & Bricker, 1984), Casto and his colleagues have reported a series of meta-analyses that indicate that intensity of intervention may be an important variable with children with disabilities (Casto, 1987; Casto & Mastropieri, 1986). Specifically, Casto (1987) noted that intensity and duration appeared to be important considerations for programs serving preschoolers with disabilities, but less so for disadvantaged populations. When adjustments were made for age at start of intervention, quality of outcome measures, and time of measurement, the range of effect sizes was .45 to .88, in favor of more intense interventions (Casto, 1987). These effect sizes indicate that more intense or longer intervention resulted in a performance difference of between about one-half to more than three-quarters of a standard deviation on whatever measure of child progress was used. These encouraging findings, however, must be viewed with caution because many studies included in the analysis were confounded by the investigator's failure to distinguish intensity and duration of intervention and/or their failure to include other important variables in the analyses. Continuing literature searches by White and his colleagues (White, 1986; White & Casto, 1985) have found few studies that have systematically compared home-based intervention programs that varied solely on the intensity of intervention.

Although not addressing the intensity issue, there are several well-designed studies which suggest home-based intervention programs are an effective way of providing early intervention to children with disabilities. Several of these studies were conducted with children considered at-risk for developmental delay due to low birthweight (Barrera, Rosenbaum, & Cunningham, 1986; Bromwich & Parmelee, 1979; Ross, 1984; Scarr-Salapatek & Williams, 1973). With the exception of Bromwich and Parmelee, each of these investigations found that home-based intervention provided during the first year of life resulted in improvements in cognitive development for children in experimental versus control groups. Barrera and her colleagues contrasted two types of home intervention, one focusing on child development and the other on parent-infant interaction with both low birthweight and normal birthweight control groups. Although both intervention groups did better than the low birthweight controls, children in the parent-infant interaction group achieved gains in more areas than those in the child development group. Neither intervention group performed as well as the normal birthweight control group (Barrera et al., 1986). Bromwich and Parmelee reported no significant differences in cognitive development, but did report differences in social skills favoring the intervention group.

A study by Sandow and her colleagues is particularly important in light of the commonly held belief that "more is better" when it comes to early intervention for children with disabilities. In a well-designed research project, a home-visit program conducted twice per month was compared to the same program provided once every two months (Sandow et al., 1981). The two service groups of 16 children (total of 32 children) were contrasted with each other and with a matched comparison group of 15 children who received no intervention. The children had a mean chronological age of two years six months and a mean mental age of one year three months at the start of the study. Differences in cognitive functioning were not statistically significant after one year; after two years differences favored the lower intensity group. After three years, there were again no statistically significant differences between groups, although the no service comparison group had only 2 children who had gained in IQ as compared to 6 in the more intense group and 5 in the less intense group. Sandow et al. concluded from their findings that less intervention may be preferred in that parents then tend to rely more on their own capabilities than on those of the interventionist(s). The authors also suggested that perhaps "a high level of intensity should gradually decrease as the parents become more capable of taking charge" (p. 140).

Piper and Pless (1980) found similar outcomes among young children with Down syndrome. That study included an experimental group of 21 children who received six months of bi-weekly center-based visits in which developmental activities were conducted with the infants (mean age 9.3 months) and demonstrated to their parents for use at home (written instructions were provided). The comparison group of 16 children (mean age 8.45 months) received no intervention. Group assignment was based on date of program entry (July to December entrants were experimental, and March to June entrants comparison). Assessments used were the Griffiths Mental Scale and the H.O.M.E. Inventory. The only statistically significant difference found at the end of the six months (pretest/posttest design) was in the "provision of appropriate play materials" subscale of the H.O.M.E. Again, the introduction of a relatively high intensity home-based intervention with infants with disabilities yielded no statistically significant differences in child developmental performance.

Finally, a recently published report from the Infant Health and Development Program (IHDP, 1990) indicated that a combined home- and center-based intervention program for low birthweight infants was effective in improving the cognitive development of these at-risk children, but that the effects for very low birthweight infants (< 1500 g) were almost nonexistent. That is, mean Stanford-Binet IQ differences at age 36 months favored the intervention group by 13 points for all children in the study, but the difference in proportions of children in this lowest birthweight group with IQs less than 70 was negligible (26.8% in the intervention group versus 28.7% in the control group). Thus the data fail to demonstrate a significant impact of intervention for children most at-risk due to low birthweight. The implications of this finding for children with developmental delays are unclear.

The research reported here represents an effort to fill a gap in the literature with respect to the optimal intensity of home-based services. This research enriches the existing data base and yields information helpful in determining the optimal frequency of home visits for young children with disabilities. It is an especially valuable addition to the literature in that it provides three to four years of follow-up data on the developmental status of the children.

The effects of varying the intensity of service were investigated within the framework of Family Systems Theory (Haley, 1976, 1980). The long-term (three to four years) impact of two intensity levels (once-per-week versus twice-per-week home visits) on both child and family outcomes was assessed. Family systems theory, an extension of the interaction process approach, provides a conceptual framework from which to study the impact of early intervention on the families of children with disabilities. A variety of factors that influence the developing child are included in this framework, and several factors considered most important were evaluated in the present investigation. Specifically, family demographics, sources of support available to the family and child, family interaction style, and parental stress were measured. Attention was paid to differential effects of intervention intensity on children with varying levels of severity of disability. Parent involvement was also assessed because some data suggest that interventions requiring substantial parent time may actually increase stress and disrupt family functioning and because home-based delivery systems often require significant amounts of parent time (Turnbull, Summers, & Brotherson, 1983). Teaching quality and adherence to the research protocol was monitored. Finally, the study includes an analysis of the cost differences between the two levels of intensity, an area in which Barnett and his colleagues (Barnett, 1986; Barnett & Escobar, 1987) have noted a sparsity of data.

Overview of Study

Children and families participating in this study were randomly assigned to either the standard or the expanded home-based intervention group. Additional center-based services such as occupational, physical, and speech therapy were available to children in both groups and were provided with an intensity level approximately equal to the frequency of home-based services for each group. Expanded services were funded collaboratively (through the efforts of the service providers and EIRI) for the 1986-87 and 1987-88 academic years.

All children and parents completed a battery of tests that measured the child's developmental status, family demographics, parental stress, sources of support, and family adaptability and cohesion. Enrollment was conducted during two academic years (1986-87 and 1987-88), such that two cohorts of subjects were enrolled. The first cohort completed its fourth posttest in 1990, while the second cohort completed its third (see Table 4.1).

Methods

Program Organization

At the time this study was conducted, the Sunshine Preschool and Richardson Center were funded under the Arkansas Developmental Disabilities Council to serve individuals with disabilities not being served by the public schools due to either age or severity of disability. For the purposes of this project, the programs were

Table 4.1

Number of Children Tested by Test Date, Group, Cohort, and Site

	Pretest Year		Posttest Session			
	1986-1987	1987-1988	First 1987-1988	Second 1988-1989	Third 1989-1990	Fourth 1990
COHORT #1						
Standard Service						
Sunshine	22	--	20	16	15	19
Richardson	5	--	4	4	3	3
Expanded Service						
Sunshine	24	--	23	20	21	21
Richardson	7	--	5	7	6	6
Total Sunshine	46		43	36	36	40
Total Richardson	12		9	11	9	9
Cohort # 1	58		52	47	45	49
COHORT #2						
Standard Service						
Sunshine	--	6	2	3	3	--
Richardson	--	4	3	3	1	--
Expanded Service						
Sunshine	--	7	7	5	5	--
Richardson	--	3	3	3	2	--
Total Sunshine		13	9	8	8	--
Total Richardson		7	6	6	3	--
Cohort # 2		20	15	14	11	--
Total Sunshine	59		52	44	44	40
Total Richardson	19		15	17	12	9
Total	78		67	61	56	49

administered by on site coordinators who managed the research. The Sunshine program served children from birth to school-age, and the Richardson Center served persons from birth to adulthood; at the preschool level, both centers had home-based programs for children birth to three and center-based programs for children three to five. The Sunshine program also provided home-based services to children three to five when transportation to the center could not be arranged.

The Sunshine school consisted of two separate facilities that housed classrooms, offices, and a vocational program. Sunshine had a larger preschool staff and served more very young clients. Both Sunshine and Richardson Centers had a well-developed philosophy of service provision. Their main service goal for preschoolers was to develop functional, generalizable skills that enhanced development. Both centers transitioned some children into public school special education programs and continued to provide school-age services to the most severely disabled. The transition process is explained in the treatment verification section.

Prior to the initiation of the research, the Richardson Center program was entirely center-based, serving children on a schedule that was agreed upon by parents and center staff. Because of serious attendance problems, staff were not satisfied that the center-based delivery system was the most effective system available for serving young children with disabilities. They looked to the Sunshine Center as a model for home-based delivery. When the director of the Richardson Center decided to adopt a home-based model, she was invited to participate in the research. The staff at Richardson were then trained and evaluated by the Sunshine Preschool coordinator. Richardson had a staff of approximately 30 professionals and paraprofessionals. Two home-teachers, a speech therapist, and a physical therapist were involved in serving the children in the study.

With the help of staff at EIRI, funds were identified and obtained to enable the directors of both the Sunshine Preschool and the Richardson Center to offer twice-per-week home-based services on a short-term basis (two years) for a limited number of children. Without these funds, the standard level of once per week or once every other week would have been provided to all children.

Subjects

Subjects for this study were children from birth to four years of age at time of enrollment who were determined eligible for early intervention services according to Arkansas Developmental Disabilities Division standards. As explained below, children in the programs involved with this project qualified for participation on the basis of their age and type and severity of disability. For each child who met the study criteria, parents signed an informed consent indicating that they were willing to participate in either the standard intensity or the expanded intensity conditions based upon a random assignment. Children were not enrolled in the study if over 48 months of age at the time of pretesting. This ensured that all participants received a minimum of one year of treatment before graduation to public school programs. The children were initially screened using the Developmental Profile II (Alpern, Boll, & Shearer, 1980). If they were functioning significantly below age level, further individualized assessments were administered. A child who could complete 75% of items at his/her age range was excluded from further evaluation. Three age levels (0 to 20 months; 21 to 36 months; and 36 to 48 months) and three levels of disability (severe [< 25% of age level]; moderate [25 to 50% of age level]; and mild [51 to 75% of age level on the Developmental Profile]) were included for stratification purposes.

Recruitment. All families with children receiving services prior to the 1986-87 academic year, and all new referrals during that year and the Fall of the 1987-88 year were approached by personnel from the Benton County Sunshine Preschool or the Richardson Center for possible participation in the study. Of those approached, all but 5 (2 at the Sunshine program and 3 at the Richardson Center) agreed to participate. This represents a 94% (78 of 83) rate of participation.

Assignment to groups. A total of 78, 3- to 48-month-old children with mild to severe developmental delays were randomly assigned to the two treatment conditions after stratification by chronological age and developmental functioning level (as described above). A complete description of assignment procedures is provided in the 1987 Annual Report of the Early Intervention Effectiveness Institute.

Attrition. Sixty-seven children were posttested one year after pretest, 61 children were tested after two years, and 56 children after three years (see Table 4.1). Forty-nine of the 58 children in the first cohort completed fourth year posttesting. The number of children not participating at each posttest and the reasons for non-participation are presented in Table 4.2. Those children whose parents refused further participation had reached school age and were being assessed at school. The parents were concerned that these children were being tested too much, and the common sentiment was that too much testing would be aversive for their children. One family at the Richardson Center refused because they felt the family measures were too intrusive. A major cause of attrition at the Sunshine Preschool was difficulty in locating families at the time of posttesting. These were primarily families that moved frequently and did not have telephones. One child at each site was placed in foster care and was, therefore, dropped from the study.

Table 4.2

Reasons for Subject Attrition by Posttest

	Number of Subjects Lost*			
Reason	Posttest #1	Posttest #2	Posttest #3	Posttest #4
Parental Refusal	3	4	7	2
Discharged from EI services	1	1	1	-
Moved, not found**	2	6	6	1
Missed Appointments***	3	2	4	2
Deceased	1	2	2	2
In & Out of Foster Care	1	2	2	2
Total	11	17	22	9

* N at pretest was 78, with 58 in cohort 1 and 20 in Cohort 2. Cohort 2 has been posttested 3 times, and cohort 1 4 times.

** Three children missed the first posttest but not the second; four missed second but not third; and four missed third but not fourth.

*** Children in this category missed at least 3 appointments for assessment.

Analyses of data on participating and non-participating families indicate statistically significant differences on satisfaction with family support between participants and non-participants at second posttest and on parental education in the group by participant status interaction at third posttest (see Table 4.3). At second posttest, participants were more satisfied with their sources of social support than were non-participants. At third posttest, participating parents in the standard intensity group had fewer years of education ($p < .10$) than non-participating parents, while the opposite held true in the expanded intensity group.

While these differences appear to threaten the validity of comparisons on child and family data, findings to this point suggest no reason to suspect that the findings are invalid. A significant correlation between parental education and child outcome in this study has been found in only the communication domain at second posttest, and the variable in question (maternal education) was included as a covariate in all posttest analyses. Parental education has not been statistically significantly correlated with total DQ in this study (ranging from $r = -.04$ to $r = .13$, $p = .40$ to $p = .14$, respectively). Furthermore, the direction of the relationship would suggest that children in the low intensity group would have depressed scores on child measures, and children in the high intensity group would have inflated scores. The data do not support this expectation.

Demographic characteristics. Pretest demographic data for subjects participating in each posttest to date are presented in Table 4.4. Families served lived in predominantly rural areas. The ethnic background of the subjects was predominantly Caucasian. Family incomes ranged from less than $5,000 to $39,999, with 28% falling into the low SES category (below $10,000). The average number of years of education for parents was between 11 and 12 years for both groups.

Table 4.3

Attrition Data for the Arkansas Intensity Study

		Low Intensity			High Intensity			ANOVA					
								Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #1													
CA at pretest	IN	27.5	(14.2)	29	29.1	(12.9)	38	.07	.79	.98	.32	.01	.93
	OUT	23.4	(15.1)	7	24.3	(4.9)	4						
BDI DQ	IN	45.1	(25.6)	29	54.8	(25.5)	38	1.29	.26	.42	.52	.00	.99
	OUT	50.6	(28.3)	7	60.4	(14.0)	4						
Total PSI	IN	248.3	(55.1)	28	255.6	(49.5)	35	.02	.90	.00	.99	.07	.79
	OUT	236.4	(45.8)	7	224.8	(43.4)	4						
FRS	IN	115.8	(25.5)	29	114.2	(20.5)	37	.25	.62	.00	.99	.07	.79
	OUT	117.9	(25.1)	7	112.0	(17.6)	4						
FSS	IN	29.4	(11.6)	29	29.3	(12.4)	38	.06	.80	.01	.91	.08	.78
	OUT	27.9	(7.2)	7	30.0	(14.7)	4						
Mother Education	IN	11.6	(2.1)	28	12.2	(2.2)	38	.55	.46	.04	.84	2.09	.15
	OUT	12.9	(2.6)	7	11.3	(1.0)	4						
Father Education	IN	11.7	(1.5)	27	12.1	(2.4)	37	.31	.58	.01	.94	1.15	.29
	OUT	12.5	(2.7)	6	11.3	3.8	4						
Income	IN	$15,339	($9,470)	28	$17,868	($10,842)	38	.00	.95	.07	.80	.64	.3
	OUT	$19,000	($10,731)	7	$16,000	($7,506)	4						
POSTTEST #2													
CA at Pretest	IN	27.5	(15.2)	26	27.8	(11.3)	35	1.35	.25	.09	.76	1.21	.28
	OUT	24.6	(14.8)	10	33.0	(17.4)	7						
BDI DQ	IN	46.1	(25.4)	35	53.4	(24.8)	35	3.54	.06	.54	.47	.82	.37
	OUT	45.3	(28.4)	10	64.9	(22.6)	7						
Total PSI	IN	243.7	(53.1)	25	254.6	(45.1)	32	.00	.97	.02	.89	.47	.49
	OUT	251.4	(55.1)	10	242.4	(68.9)	7						
FRS	IN	115.5	(25.8)	26	113.6	(18.7)	35	.13	.72	.10	.76	.01	.94
	OUT	118.0	(24.1)	10	115.2	(28.9)	6						
FSS	IN	20.8	(11.0)	26	30.6	(13.1)	35	.09	.77	4.59	.04	.05	.82
	OUT	24.7	(9.5)	10	23.0	(5.9)	7						
Mother Education	IN	11.8	(2.1)	26	11.9	(1.8)	35	.67	.47	1.99	.16	.46	.50
	OUT	12.2	(2.6)	9	13.1	(3.3)	7						
Father Education	IN	11.9	(1.4)	26	12.2	(2.3)	34	.04	.85	.52	.47	.46	.50
	OUT	11.9	(2.7)	7	11.3	(3.6)	7						
Income	IN	$15,653	($9,756)	26	$17,057	($9,750)	35	.74	.39	.88	35	.14	.71
	OUT	$17,278	($9,941)	9	$20,857	($14,232)	7						

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Table 4.3 (continued)

Attrition Data for the Arkansas Intensity Study

		Low Intensity			High Intensity			ANOVA					
								Group		Study Status		Group by Status	
Variable		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p	F	p	F	p
POSTTEST #3													
CA at pretest	IN	29.3	(15.3)	22	27.9	(12.5)	34	1.31	.26	.13	.72	2.47	.12
	OUT	22.6	(11.7)	14	32.0	(12.4)	8						
BDI DQ	IN	46.3	(26.3)	22	54.8	(26.2)	34	2.30	.13	.04	.84	.06	.81
	OUT	46.0	(26.0)	14	57.7	(17.2)	8						
Total PSI	IN	247.4	(50.8)	21	248.9	(47.6)	31	.78	.38	.25	.62	.60	.44
	OUT	243.6	(57.9)	14	266.9	(56.7	8						
FRS	IN	111.5	(26.7)	22	114.5	(20.2)	34	.69	.41	.46	.50	1.76	.19
	OUT	123.6	(21.0)	14	110.6	(20.5)	7						
FSS	IN	30.1	(11.5)	22	29.8	(12.9)	34	.00	.95	.62	.43	.00	.97
	OUT	27.6	(9.9)	14	27.5	(11.1)	8						
Mother Education	IN	11.3	(1.6)	22	12.1	(2.2)	34	.06	.81	1.00	.32	2.91	.09
	OUT	12.8	(2.8)	13	11.8	(1.9)	8						
Father Education	IN	11.5	(1.1)	22	12.3	(2.4)	33	.57	.45	.00	.98	4.91	.03
	OUT	12.7	(2.4)	11	11.0	(2.9)	8						
Income	IN	$13,227	($8,071)	22	$17,926	($10,985)	34	.01	.92	1.50	.22	2.89	.09
	OUT	$20,885	($10,570)	13	$16,668	($8,774)	8						
POSTTEST #4													
CA at Pretest	IN	27.8	(15.5)	22	25.7	(11.9)	27	3.18	.08	.05	.82	4.90	.03
	OUT	16.0	(8.1)	5	35.3	(12.2)	4						
BDI DQ	IN	48.9	(24.4)	22	56.1	(26.7)	27	3.39	.07	.82	.37	1.16	.29
	OUT	30.3	(31.9)	5	57.7	(14.0)	4						
Total PSI	IN	254.6	(58.9)	22	245.1	(46.3)	27	.30	.59	2.53	.12	.00	.98
	OUT	226.2	(21.3)	5	216.0	(30.1)	4						
FRS	IN	114.2	(26.5)	22	114.7	(19.9)	27	.10	.75	1.72	.20	.14	.71
	OUT	129.2	(20.7)	5	123.0	(8.9)	4						
FSS	IN	28.9	(12.3)	22	30.7	(13.2)	27	.05	.83	.72	.40	.03	.86
	OUT	33.6	(8.9)	5	33.8	(11.8)	4						
Mother Education	IN	11.2	(1.7)	22	12.4	(2.1)	27	.14	.71	.82	.37	3.67	.06
	OUT	12.0	(3.4)	4	10.3	(1.7)	4						
Father Education	IN	11.4	(1.1)	21	12.1	(2.5)	26	33	.57	.23	63	.07	.79
	OUT	11.3	(2.2)	4	11.5	(3.4)	4						
Income	IN	$15,795	($9,127)	22	$18,037	($10,865)	27	.38	.54	.11	.74	.00	.99
	OUT	$14,500	($5,583)	4	$16,875	($6,650)	4						

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Table 4.4

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	POSTTEST #1								POSTTEST #2							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Child's age (in months)	69.9	(14.9)	29	66.6	(13.8)	38	.75	-.07	69.5	(14.7)	26	67.6	(12.1)	35	.60	-.13
Mother's age	32.5	(7.0)	27	32.4	(7.4)	38	.95	-.01	31.9	(7.0)	25	31.5	(7.0)	34	.81	-.06
Father's age	34.3	(7.6)	27	35.0	(8.4)	37	.74	.09	33.7	(7.9)	26	34.0	(8.0)	33	.87	.04
Mother's education	11.6	(2.1)	28	12.2	(2.2)	38	.34	.29	11.8	(2.1)	26	11.9	(1.8)	35	.87	.05
Father's education	11.7	(1.5)	27	12.1	(2.4)	37	.42	.27	11.9	(1.4)	26	12.2	(2.3)	34	.50	.21
Percent with both parents living at home	79.3		29	84.2		38	.62	.13	84.6		26	85.7		35	.91	.04
Hours per week mother employed	8.5	(16.0)	28	20.1	(21.4)	38	.01	.73	10.7	(17.3)	26	18.9	(18.8)	35	.08	.47
Hours per week father employed	33.6	(21.5)	27	39.5	(16.6)	37	.24	.27	36.5	(19.5)	26	39.3	(18.2)	34	.57	.14
Percent mothers who work outside of home	28.6		28	55.3		38	.02	-.51	30.8		26	57.1		35	.04	-.50
Percent fathers in technical/managerial positions	7.4		27	16.2		37	.28	.21	7.7		26	11.8		34	.60	.09
Total Household Income	$15,339	($9,470)	28	$17,868	($10,642)	38	.32	.27	$15,653	($9,756)	26	$17,057	($9,749)	35	.58	.14
Percent on public assistance	53.6		26	52.6		38	.94	.02	50.0		26	48.6		35	.91	.03
Mother as primary caregiver	62.8		29	81.6		38	.08	.42	84.6		26	80.0		35	.65	-.09
Percent in daycare > 5 hours per day	20.7		29	40.5		37	.15	-.39	23.1		26	42.7		35	.10	-.38
Number of siblings	1.5	(1.6)	28	1.2	(1.2)	38	.36	-.19	1.4	(1.3)	26	1.1	(1.1)	35	.40	-.23
Percent Male	62.1		29	63.2		38	.92	.02	61.5		26	57.1		35	.75	.08
Percent Caucasian	93.1		29	94.7		38	.74	.08	96.2		26	94.3		35	.88	.04

(continued)

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Table 4.4 (continued)

Pretest Demographic Data for Subjects in the Arkansas Intensity Study

	POSTTEST #3								POSTTEST #4							
	Standard			Expanded					Standard			Expanded				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES
Child's age (in months)	71.9	(16.0)	22	68.0	(13.0)	34	.34	-.24	72.0	(16.2)	22	68.8	(12.9)	27	.43	-.20
Mother's age	32.7	(7.4)	21	31.8	(7.0)	34	.66	-.12	32.8	(6.8)	21	32.7	(7.3)	27	.93	-.01
Father's age	33.9	(7.9)	22	34.2	(8.1)	33	.87	.04	34.3	(6.8)	21	34.9	(8.8)	26	.80	.09
Mother's education	11.3	(1.6)	22	12.1	(2.2)	34	.11	.50	11.2	(1.7)	22	12.4	(2.1)	27	.03	.71
Father's education	11.5	(1.1)	22	12.3	(2.4)	33	.08	.73	11.4	(1.1)	21	12.1	(2.5)	26	.22	.64
Percent with both parents living at home	86.4		22	85.3		34	.91	.00	81.8		22	81.5		27	.98	.00
Hours per week mother employed	9.9	(17.4)	22	18.3	(18.7)	34	.09	.48	9.1	(16.4)	22	17.6	(19.4)	27	.10	.52
Hours per week father employed	33.3	(22.2)	22	38.8	(17.4)	33	.34	.25	37.3	(20.1)	21	38.9	(19.8)	28	.78	.08
Percent mothers who work outside of home	27.3		22	55.9		34	.03	-.54	27.3		22	51.9		27	.08	-.46
Percent fathers in technical/managerial positions	0		22	15.2		33	.13	.40	4.8		21	15.4		26	.23	.26
Total Household Income	$13,227	($8,070)	22	$17,926	($10,986)	34	.07	.58	$15,795	($9,127)	22	$18,037	($10,865)	27	.44	.25
Percent on public assistance	54.6		22	52.9		34	.91	.03	50.0		22	55.6		27	.71	-.10
Mother as primary caregiver	86.4		22	82.4		34	.69	-.07	81.8		22	77.8		27	.73	-.08
Percent in daycare > 5 hours per day	22.7		22	38.2		34	.22	-.29	18.2		22	33.3		27	.23	-.30
Number of siblings	1.7	(1.7)	22	1.1	(1.2)	34	.21	-.35	1.8	(1.6)	22	1.1	(1.0)	27	.07	-.44
Percent Male	68.2		22	61.8		34	.67	.11	59.1		22	55.6		27	.89	.06
Percent Caucasian	95.5		22	94.1		34	.99	.00	95.5		22	92.6		27	.80	.07

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Intervention Programs

The expanded intervention was an extension of the standard service that was delivered prior to the initiation of the research. During the first year of the study, the intention was to provide services to the standard intensity group once every two weeks, and the expanded intensity group twice per week, resulting in a 1:4 intensity comparison. In response to requests from the service providers to deliver services that more accurately reflected their preferred service model, the targeted level of services for the standard intensity group was increased to once per week during the second year of the study. As a result, the intended comparison during the second year involved a 1:2 intensity difference. The actual number of home visits provided to each group per year of the study is presented in Table 4.5. For children completing Posttest #3, the intervention ratio was 2.40:1 (expanded: standard). A total of 16 (6 in standard and 10 in expanded intervention) children were discharged from the home visit program after the first year of the study.

Standard intervention group. The standard intensity group received home visits from trained paraprofessionals (mean rate of attendance was 81%). The preschool supervisor was responsible for training. As noted above, the intended frequency of home visits was once every other week during Year 1 and once per week during Year 2 of the study. The home teachers spent two weeks in individualized training, and were then closely supervised on their first home visits. Nine home teachers participated, of whom two had baccalaureate degrees, and all had extensive experience and background in early intervention.

Motor and speech/language therapists provided individual therapy to children whose evaluation data indicated a therapy need on a weekly basis. The children were brought to the center for their therapies that lasted approximately ½ hour. The home-based intervention took place primarily in the subject's home, although a small number of children were visited in daycare centers or at baby sitters. Home teachers

Table 4.5

Number of Home Visits by Study Year and Posttest Session

	Standard Intensity			Expanded Intensity				
Study Year	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Ratio of Services	p Value
1986-87	11.1	(3.2)	24	34.6	(12.8)	28	3.13	.00
1987-88	29.0	(9.0)	21	52.7	(20.2)	31	1.82	.00
Both years (first posttest group)	29.0	(16.6)	29	68.5	(32.3)	38	2.36	.00
Both years (2nd posttest group)	32.2	(15.3)	25	69.7	(33.2)	36	2.16	.00
Both years (3rd posttest group)	29.5	(16.6)	22	70.8	(33.0)	34	2.40	.00
Both years (4th posttest group)	31.4	(17.9)	22	75.0	(32.4)	27	2.39	.00

* N for the first year includes only children in the first cohort, and the N for the second year includes second cohort children plus those still receiving home visits during the second year of the study. Data are provided only for those years during which expanded services were available.

focused on working with the children directly. The parents were expected to observe and demonstrate to the home visitor what they had learned. Home visits lasted approximately one hour.

An Individual Education Plan (IEP) was developed for each child and was used to guide the educator in working with the child and parent(s) during the sessions. The content of the home visits was taken from the IEP, which was based on recommendations made by the multidisciplinary assessment team, which typically included a psychologist, speech/language pathologist, OT/PT, educator, and the child's parent. Goals and objectives for the child were agreed upon by the educator and the parent, considering the parents' needs and the child's progress over time. A variety of assessment instruments and curricula were used to develop the objectives in the IEP.

Intervention programs focusing on development of functional skills were provided by the home teachers and were individualized based on the child's developmental level and family's functioning. Typical goals included self-help (particularly feeding), gross motor, and communication skills. The primary care taker was required to demonstrate skill in positioning, feeding, and in 15 cases, medical technology such as oxygen, respirators, gavage feeding, and catheters. The home teachers were specially trained in these areas and helped parents meet the medical as well as developmental needs of their children. Children with less severe disabilities received programs focusing on their language, cognitive, self-help, and gross and fine motor needs.

Home teachers were assigned to children based on the children's level of functioning such that each teacher served approximately equal numbers of children in both groups. Three of the nine teachers had extensive experience with the severely disabled. The other teachers had early childhood backgrounds as indicated in Table 4.6, which also indicates the number of children served by each teacher in each group. Each teacher was observed at least two times annually by the EIRI staff coordinator and consistently demonstrated knowledge, creativity, and sensitivity in dealing with young children with disabilities and their families.

Home visits included the following activities: warm-up play period, discussion of current concerns and child's status, direct 1:1 programming designed to meet specific objectives, work with the parents, discussion of progress made towards

Table 4.6

Teacher Qualification and Original Assignments

Teacher	Education	Experience	# of Children in Standard	# of Children in Expanded
1	14 years	1 year	5	4
2	12 years	6 years	4	6
3	12 years	1 year	0	2
4	B.A.	2 years	7	6
5	M.A.	3 years	5	7
6	12 years	10 years	6	6
7	12+ years	1 year	4	5
8	12+ years	1 year	5	5
9	B.A.	2 years	0	1
TOTAL			*36*	*42*

specific objectives, work with the parents, discussion of progress made towards objectives, and data recording. When ending the visit, the teacher reminded the parent of the next visit and of any scheduled therapies; left data sheets, program descriptions, detailed instructions, and materials for the parent to use; and gave the parent encouragement for their efforts. Program data and anecdotal notes were recorded for each home visit.

The curriculum was based on comprehensive assessments and a modification of the Learning Accomplishment Profile. The home teacher brought a variety of materials and toys for programs and the child's folder for recording data. She worked individually with the child, keeping data on 4 to 6 goal areas. Every attempt was made to involve the parents in the activities. For example, the home teacher might demonstrate how to position a child for feeding and provide direct modeling, shaping, prompting, and positive reinforcement to the parent. Once the teacher had instructed the parent on how to carry out the activity, a schedule was set up for the parent to follow. The amount of time a parent was expected to spend with the child depended on the child's needs and the parent's willingness and ability.

The teachers created data recording sheets for parents that included the following: (1) a specification of the activities to be conducted; (2) spaces to record data and duration of activity; and (3) spaces to record correct responses and errors, as well as progress made towards the objective. For example, in a feeding program, the key data recorded would be that the child consumed two ounces orally. In some cases, however, the only record made by parents was whether or not the activity took place or if the activity was successful.

Teachers kept detailed data on number of trials, correct and error rates, and a specified description of what progress took place towards each objective addressed. The teachers' anecdotal records tended to describe the session, the parents and child response, and plans for the next session.

The IEPs were evaluated by the multidisciplinary team on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary and shared with the multidisciplinary team. (During the site visit described below, 10% of the IEPs were randomly sampled for evaluation and were found to be age appropriate, developmental, and functional in nature.)

Expanded intensity group. The expanded intensity group received exactly the same type of service delivery (mean rate of attendance was 82%) as the low intensity group, but with at least double the frequency of home visits (see Table 4.5).

Treatment verification. A number of procedures were implemented in order to verify that the interventions for the two different experimental groups were being implemented as intended.

The EIRI coordinator communicated on at least a weekly basis with the on site coordinator, assisted in areas of program development and child find efforts, and made periodic site visits. The site was visited three times during the 1987-1988 year by the EIRI site coordinator. Other program verification activities included in the following:

1. *Collection of attendance data.* The child's participation in the program for both groups was recorded according to the length of the session and the staff involved. Non-attendance at regularly scheduled sessions was also recorded according to the reason for non-attendance. Table 4.5, discussed above, contains attendance data by group for the two years during which expanded services were available (1987-87 and 1987-88). Rates of attendance for home visits were nearly equal across groups (81% for the standard group versus 82% for the expanded group).

2. *Data describing the level of parent involvement.* Home teachers rated parents in three areas: attendance (in IEP meetings, therapy, home visits), knowledge regarding their child and rights, and support activities (follow through, communication with staff, form completion, etc.). Parents were rated on each area with a 3-point scale, 1 = low, 2 = average, 3 = high. Table 4.7 contains the results of this teacher rating of parent involvement. Although none of the between group differences are statistically significant, the large effect sizes (Mean = .37) suggest that teachers rated parents in the expanded group as more involved than those in the standard group.

Table 4.7

Teacher Ratings of Parent Involvement* in the Home Visit Program

	Standard Intensity			Expanded Intensity				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ES	p
Attendance at visits and other activities	2.07	.799	29	2.29	.694	38	.28	.24
Knowledge/Understanding of the child's program	1.90	.860	29	2.18	.766	38	.33	.16
Support of the child's program/activities	1.72	.797	29	2.13	.844	38	.51	.05

* 1 = Some involvement
2 = Moderate Involvement
3 = High Involvement

3. *Teacher evaluations.* The preschool supervisor evaluated teachers using two scales developed by EIRI staff. One was a 3-point scale (2 = criteria fully met; 1 = partially met; 0 = not met) that addressed five areas: teacher assessment skills, IEP development skills, IEP implementation skills, presentation of instruction, and instructional

environment. The second assessed the following six teacher traits on a 5-point scale (5 = outstanding, 4 = very good, 3 = good, 2 = needs improvement, and 1 = inadequate): teaching skills, problem solving, work habits, relationships, communication skills, and attitude. Thus the minimum score was 6 and the maximum was 40. Actual teacher rating totals are presented in Table 4.8. Although there are some differences among teachers, the fact that all teachers had children in each group means that these differences did not bias the results of the study.

Table 4.8

Teacher Evaluation Ratings

Teacher	1	2	3	4	5	6	7	8	9
Rating	21	34	24	29	40	30	40	40	32

4. ***Parent Satisfaction Data.*** Parents completed a seven-item Satisfaction with Services Form to assess the degree to which parents in each group were satisfied with the services they received. Table 4.9 indicates that there were no statistically significant differences between groups in any of the areas addressed, but that three effect sizes greater than .30 were found. The expanded group tended to feel better in all areas except one, but both groups reported satisfaction in all areas.

Table 4.9

Parent Ratings of the Quality of the Home Visit Program*

	Standard Intensity			Expanded Intensity				
Study Year	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Program Staff	3.8	(.4)	29	3.9	(.3)	33	.58	.13
Communication w/Staff	3.7	(.5)	29	3.6	(.6)	33	.28	-.31
Program Goals	3.5	(.6)	29	3.7	(.5)	33	.21	.30
Participation	3.5	(.7)	29	3.6	(.6)	33	.59	.13
Range of Services	3.3	(.6)	29	3.5	(.7)	33	.39	.23
Child Progress	3.2	(1.1)	29	3.6	(.7)	33	.13	.33
Overall	3.1	(1.2)	29	3.4	(.9)	33	.29	.24

* Ratings ranged from 1 = Poor to 4 = Excellent.

5. ***Site Review.*** Formal site reviews were conducted at the end of each treatment year as a part of a continuous effort to verify that treatment was taking place as planned. The EIRI Site Coordinator met with both Richardson and Sunshine Coordinators as well as with parents, ancillary staff, and all home teachers. In addition, the EIRI Site Coordinator attended a sample of home visits to observe each teacher at work.

   Results of the site reviews indicated that the project was well organized and implemented. The program files were in good order, containing up-to-date IEPs, quarterly reports of progress, assessment information, and description of services received. Randomly selected IEPs were reviewed, and all were found to contain the following: (1) a statement of current level of performance (both norm and criterion referenced); (2) annual goals and short-term objectives that were functional, appropriate, and individualized; (3) evaluation of criteria for determining when the objectives were met; and (4) timelines for monitoring.

Cost of alternative interventions. The cost of the Sunshine Preschool and Richardson Center programs as described above was determined using the ingredient approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, travel, materials and supplies, miscellaneous and contributed resources. Total costs in each resource category for both programs were first added together and then prorated according to program intensity: 60% of resources were consumed by the high-intensity program and 40% by the low-intensity program. Allocation is based on total number of child visits to the high-intensity program as contrasted with the total low-intensity child visits out of the total number of visits to both programs. Cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each group. Table 4.10 presents the cost per child in each of these resource categories.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to the program. Occupancy charges were based upon the replacement value of the facilities in which the programs were housed, annualized to account for interest and depreciation, and included all utilities, insurance, and maintenance costs. Equipment costs were based on the market replacement value of office furniture and equipment used by the program and also included equipment repair. Equipment cost, like facilities, was annualized to account for interest and depreciation. Staff transportation costs for home visits and other job-related travel were reimbursed by Sunshine Preschool and Richardson Center at the rate of $.23 per mile and $.22 per mile, respectively. The

Table 4.10

Cost Per Child for Sunshine School/Richardson Center (1987-88)

Resources	Expanded Intensity (N = 27)	Standard Intensity (N = 36)
1. **UNDISCOUNTED**		
Agency Personnel:		
Direct Service	$ 4,336	$2,169
Administrative	1,658	828
Facilities	561	281
Equipment	118	59
Materials/Supplies	244	121
Staff Transportation	395	198
Miscellaneous	807	403
Subtotal	$ 8,118	$4,059
Contributed Resources:		
Parent time	927	610
Parent Travel	332	166
Volunteer	32	16
Subtotal	$ 1,291	$ 792
TOTAL	$ 9,409	$4,851
2. **DISCOUNTED (3%)**		
Agency Resources	$ 8,871	$4,435
Total Resources	10,281	5,301
3. **DISCOUNTED (5%)**		
Agency Resources	$ 9,398	$4,699
Total Resources	10,892	5,616

Totals may not add up due to rounding errors

cost for materials and supplies and miscellaneous included the annual expense for all consumable items and miscellaneous expenses incurred by each program.

Contributed resources included the value of volunteer and parent time. Community members contributed 144 hours during the year to the programs. Parents in the high-intensity group spent an average of 58.1 hours in home visit sessions and an average of 333.89 hours in therapy sessions. Parents in the lower intensity group spent an average of 30.8 hours in home visits and 29.7 hours in therapy sessions. Parents were interviewed via telephone to determine the time and out-of-pocket expenses incurred getting their children to the center for therapy sessions.

All parent and volunteer time in the program was assigned the opportunity cost of $9 per hour, and mileage was estimated at $.21 per mile.

Data Collection

Data concerning child and family functioning were collected at enrollment and annually thereafter. Testing procedures and results of each data collection effort are presented below.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians and a local assessment supervisor were trained and certified by EIRI standards. None were employed by either service provider, and testing assignments were made by the assessment supervisor to ensure that all diagnosticians were unaware of subjects' group placement. The diagnosticians possessed masters degrees in psychology, and the supervisor had a Ph.D. The assessment supervisor was responsible for shadow scoring 10% of each diagnostician's test administrations, scheduling testing, and collecting, reviewing, and sending all protocols to the EIRI site coordinator.

Interrater reliability for the BDIs that were shadow scored were calculated by dividing the number of agreements by the total number of items administered. Reliability coefficients averaged .95 (range .80 to 1.00).

Pretest. Parents of each child participating in the study signed an informed consent form and provided demographic information. Children were administered the Battelle Developmental Inventory, and parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Inventory of Life Events and Changes, and the Family Adaptability and Cohesion Evaluation Scales as pretest measures. Parents were paid a $20 incentive for pretesting. As explained later, data from these measures were used as covariates in the analyses as well as for investigating whether certain types of families or certain types of children benefited more from intervention than others.

Posttest #1. First year posttest data were collected on 67 children. Data were collected in May and June, 1987, for the first cohort, and in May and June, 1988, for the second. Measures included the BDI and the Sequenced Inventory of Communication Development (SICD), in addition to the various parent questionnaires mentioned above. In addition, parents completed a satisfaction with treatment questionnaire, a report of child's health, and a report of additional services received (i.e., services that were not provided as part of the intervention program). The SICD was chosen because of the intervention emphasis on language development. Pretest demographic data and treatment verification data were used in the analyses to improve the generalizability of our data by allowing us to control for family demographic differences and differences in the intensity of the intervention. The parent incentive for the first posttest was increased to $30 because of the addition of the SICD.

Posttest #2. Second year posttest data were collected in May and June, 1988, for Cohort 1, and May and June, 1989, for Cohort 2. Sixty-one children completed the second posttest. Measures of child functioning included the BDI, SICD, and the Vineland; the standard set of parent measures was again administered. With the addition of the Vineland to the posttest measures, the parent incentive was increased to $50.

Posttest #3. Third year posttest data have been collected on 56 children. Measures of child functioning included the BDI, SICD, and Vineland; the standard set of parent measures was again administered. The parent incentive was $50, as established for the third posttest.

Posttest #4. Fourth year posttest data were collected in May and June 1990 on 49 children in the first cohort; data are expected for 12 more children in the 2nd cohort in the Spring of 1991. The same measures were used as on the 3rd posttest and parents were again paid $50 for participating.

Results and Discussion

Comparability of Groups on Pretest Measures

Pretest data from child and family measures appear in Table 4.11. No statistically significant pretest differences were found in any BDI domain, although the high intensity group performed at higher DQ levels in all domains. Family measures also revealed some statistically significant pretest differences at each posttest group with regard to demographic characteristics, mothers' occupational status, hours per week mothers were employed, maternal education, and the percentage of children in daycare were all higher among the expanded group, although the statistical significance of the differences varied between posttest session (see Table 4.4). These differences were investigated in posttest analyses. It is worth noting that these differences existed even though subjects were randomly assigned to groups. Also, in interpreting the results of the outcome measures for this study, it is important to remember that if there is a pretreatment bias in the groups, it appears to be in favor of the expanded intervention group.

Measures of Child Functioning

Results of the four posttests are contained in Table 4.12. Battelle pretest data (in each domain) were the best predictors of Battelle posttest scores, with correlations ranging between .67 and .96. All correlations were statistically significant at the $p < .001$ level. Regression analyses indicated that when BDI total DQ (Age Equivalent/Chronological Age) was used as a correlate of child functioning measures, other variables, including family data, did not account for a statistically significant additional amount of variance in outcome measures. When the pretest demographic measures that were statistically significantly different (see Table 4.4) were included, missing data caused some cases to be dropped. The changes in posttest scores resulting from their inclusion were so small that it was decided to not use them as covariates. Maternal education, however, did account for

Table 4.11

Pretest Data for Children and Families in the Arkansas Intensity Study

Variable	POSTTEST #1										POSTTEST #2									
	Standard				Expanded						Standard				Expanded					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES
Battelle Developmental Inventory (BDI)																				
Personal/Social	48.0	(28.3)		29	53.7	(23.5)		38	.18	.20	49.9	(26.0)		26	53.2	(22.8)		35	.38	.13
Adaptive Behavior	47.1	(26.9)		29	58.6	(26.7)		38	.16	.43	50.2	(27.0)		26	56.7	(25.0)		35	.47	.24
Motor	44.0	(26.0)		29	53.8	(27.4)		38	.25	.38	43.8	(25.5)		26	50.7	(27.7)		35	.47	.27
Communication	40.5	(27.1)		29	49.5	(25.0)		38	.29	.33	43.1	(27.1)		26	49.3	(26.3)		35	.61	.23
Cognitive	44.4	(25.9)		29	55.9	(27.5)		38	.32	.44	44.6	(25.5)		26	55.2	(26.9)		35	.45	.42
TOTAL	45.1	(25.6)		29	54.8	(25.5)		38	.20	.38	46.5	(25.4)		26	53.4	(24.8)		35	.44	.27
Parent Stress Index (PSI)																				
Child Related	121.3	(27.8)	89	28	120.4	(23.8)	88	35	.89	.03	118.8	(28.2)	87	25	120.0	(22.2)	88	32	.86	-.04
Other Related	127.0	(32.3)	61	28	135.2	(30.5)	73	35	.31	-.25	124.9	(30.3)	58	25	134.6	(28.7)	73	32	.23	-.32
TOTAL	248.3	(55.1)	78	28	255.6	(49.5)	84	35	.59	-.13	243.7	(53.1)	75	25	254.8	(45.1)	83	32	.42	-.21
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Discrepancy	11.6	(11.7)		29	11.3	(7.3)		36	.90	.03	13.2	(11.9)		26	11.6	(7.4)		33	.55	.13
Adaptation	5.3	(5.0)		29	4.9	(3.1)		36	.69	.08	5.2	(5.1)		26	5.0	(3.2)		33	.89	.04
Cohesion	5.1	(4.7)		29	4.2	(3.1)		36	.38	.19	5.1	(4.9)		26	4.5	(3.1)		33	.57	.12
TOTAL	6.0	(6.1)		29	7.2	(3.1)		36	.50	-.20	7.9	(6.2)		26	7.4	(3.1)		33	.70	.08
Family Resource Scale (FRS)	115.8	(25.5)	46	29	114.0	(20.5)	41	37	.76	-.07	115.5	(25.6)	46	26	113.6	(16.7)	41	35	.75	-.07
Family Support Scale (FSS)	29.4	(11.6)	54	29	29.3	(12.4)	54	36	.96	-.01	30.8	(10.9)	63	26	30.6	(13.1)	63	35	.94	-.02
Family Inventory of Life Events (FILE)	8.7	(4.9)	47	29	12.2	(8.4)	29	36	.04	-.71	8.7	(5.3)	47	25	11.8	(7.4)	29	33	.07	-.58

(continued)

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Table 4.11 (continued)

Pretest Data for Children and Families in the Arkansas Intensity Study

	POSTTEST #3										POSTTEST #4									
	Standard				Expanded						Standard				Expanded					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	P Value	ES
Batteile Developmental Inventory (BDI)																				
Personal/Social	48.4	(29.1)		22	54.5	(23.8)		34	.51	.21	49.1	(29.9)		22	56.6	(24.3)		27	.48	.25
Adaptive Behavior	47.8	(26.6)		22	59.1	(27.6)		34	.55	.42	50.2	(26.4)		22	60.7	(27.9)		27	.63	.40
Motor	47.7	(27.1)		22	52.5	(28.3)		34	.86	.18	50.1	(24.0)		22	51.5	(26.9)		27	.76	.06
Communication	44.3	(27.6)		22	49.2	(24.8)		34	.96	.18	41.9	(27.9)		22	51.2	(26.0)		27	.74	.33
Cognitive	45.1	(25.0)		22	56.5	(28.2)		34	.77	.46	47.6	(24.0)		22	56.9	(29.0)		27	.98	.39
TOTAL	46.3	(26.3)		22	54.8	(26.2)		34	.71	.32	48.9	(24.4)		22	56.1	(26.7)		27	.82	.30
Parent Stress Index (PSI)																				
Child Related	122.6	(27.7)	92	21	116.4	(22.8)	85	31	.40	.22	125.9	(29.5)	92	22	115.3	(23.6)	82	27	.18	.36
Other Related	124.8	(28.0)	58	21	132.5	(29.8)	71	31	.35	-.28	128.8	(33.6)	65	22	129.9	(28.6)	66	27	.91	-.03
TOTAL	247.4	(50.8)	77	21	248.9	(47.6)	79	31	.92	-.03	254.8	(58.9)	83	22	245.1	(46.3)	76	27	.54	.16
Family Adaptation and Cohesion Evaluation Scales (FACES)																				
Discrepancy	11.4	(12.8)		22	11.9	(7.3)		32	.86	-.04	12.1	(12.0)		22	11.4	(7.1)		25	.62	.06
Adaptation	5.1	(3.8)		22	5.1	(3.2)		32	.94	.00	5.9	(5.4)		22	5.5	(3.4)		25	.79	.07
Cohesion	5.5	(5.2)		22	4.5	(3.1)		32	.46	-.27	5.6	(5.3)		22	4.5	(3.3)		25	.42	.21
TOTAL	6.0	(5.6)		22	7.5	(3.1)		32	.70	.09	8.8	(6.8)		22	8.0	(2.9)		25	.62	.12
Family Resource Scale (FRS)	111.5	(26.7)	39	22	114.5	(20.2)	43	34	.66	.11	114.2	(26.5)	41	22	114.7	(19.9)	43	27	.94	.02
Family Support Scale (FSS)	30.1	(11.5)	57	22	29.8	(12.9)	57	34	.92	-.03	28.9	(12.3)	54	22	30.7	(13.2)	63	27	.63	.15
Family Inventory of Life Events (FILE)	9.0	(5.4)	47	21	11.3	(7.6)	34	32	.21	-.43	9.1	(5.1)	47	22	12.2	(7.6)	29	26	.11	-.61

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Table 4.12

Posttest Measures of Child Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity				Expanded Intensity						
Variables	Covariates♦	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES**
POSTTEST #1 (CA months)		35.6	(14.2)		29	35.5	(12.3)		38	.09	.97	-.01
Battelle Developmental Inventory* (BDI)												
Personal-Social	1	47.8	(23.7)	51.1	28	53.2	(21.4)	49.9	38	1.46	.23	-.05
Adaptive Behavior	1	51.8	(28.4)	55.4	28	56.8	(23.8)	53.3	38	2.39	.13	-.08
Motor	1	48.9	(27.3)	52.3	28	57.6	(29.1)	54.2	38	2.39	.13	-.08
Communication	1	41.2	(24.7)	44.6	28	56.5	(26.2)	53.1	38	.09	.77	.34
Cognitive	1	53.6	(31.1)	57.7	28	55.4	(26.5)	51.3	38	4.47	.04	-.21
TOTAL		48.3	(24.5)	51.9	28	55.8	(22.9)	52.2	38	1.58	.21	.01
SICD♣												
Receptive	1	-14.6	(10.2)	-13.4	28	-12.7	(10.7)	-13.9	38	.12	.79	-.06
Expressive	1	-17.0	(9.6)	-15.8	28	-15.0	(12.5)	-16.2	38	.15	.85	-.04
POSTTEST #2 (CA months)		46.7	(15.0)		26	44.9	(11.6)		35	.74	.58	
Battelle Developmental Inventory* (BDI)												
Personal-Social	1	50.7	(28.5)	53.9	26	60.3	(29.4)	57.0	35	.09	.76	.11
Adaptive Behavior	1	49.9	(30.4)	52.8	26	55.7	(24.8)	52.7	35	.54	.47	.00
Motor	1	48.3	(33.0)	51.4	26	54.1	(28.7)	51.0	35	.14	.71	-.01
Communication	1	42.7	(27.3)	45.7	26	53.5	(27.2)	50.5	35	.03	.87	.18
Cognitive	1	47.9	(30.7)	51.4	26	55.8	(29.9)	52.4	35	.46	.50	.03
TOTAL		47.3	(27.0)	50.4	26	55.8	(24.5)	52.7	35	.06	.80	.09
SICD♣												
Receptive	1	-10.8	(21.1)	-10.2	24	-5.4	(21.0)	-6.0	30	1.05	.46	.20
Expressive	1	-9.9	(25.2)	-9.3	24	-1.9	(23.3)	-2.5	30	.52	.31	.27
Vineland (DQs)												
Communication Domain	1	48.9	(29.1)	52.1	24	55.8	(26.6)	52.6	31	.01	.92	.02
Daily Living Domain	1	55.0	(33.8)	58.0	24	60.4	(26.0)	57.4	31	.01	.92	-.02
Socialization Domain	1	49.7	(27.5)	52.4	24	55.6	(23.3)	52.9	31	.01	.93	.02
POSTTEST #3 (CA months)		60.6	(15.1)		22	57.4	(13.0)		34	1.35	.43	.21
Battelle Developmental Inventory* (BDI)												
Personal-Social	1	48.4	(28.8)	52.8	22	60.9	(31.3)	56.4	34	.13	.72	.13
Adaptive Behavior	1	46.2	(29.3)	50.2	22	59.6	(30.0)	55.5	34	.70	.41	.18
Motor	1	46.2	(33.6)	49.6	22	55.0	(30.5)	51.6	34	.20	.66	.06
Communication	1	42.2	(26.5)	46.1	22	50.9	(27.6)	47.1	34	.17	.68	.04
Cognitive	1	49.8	(32.9)	53.4	22	55.6	(30.7)	52.0	34	.67	.42	.04
TOTAL		46.3	(26.3)	49.7	22	54.8	(26.2)	52.3	34	.02	.89	.10
SICD♣												
Receptive	1	-36.2	(15.6)	-25.7	21	-27.2	(19.3)	-25.7	34	.58	.99	0
Expressive	1	-27.4	(19.5)	-30.9	21	-24.0	(19.7)	-28.5	34	.00	.45	.12
Vineland (DQs)												
Communication Domain	1	47.4	(27.4)	50.9	22	55.6	(30.3)	52.2	35	.62	.81	.05
Daily Living Domain	1	50.7	(27.0)	54.2	22	58.1	(29.0)	54.6	35	.01	.93	.01
Socialization Domain	1	47.1	(27.5)	50.5	22	55.1	(29.3)	51.8	35	.05	.82	.05
POSTTEST #4 (CA months)		70.9	(16.2)		22	67.3	(13.2)		27	.92	.40	.22
Battelle Developmental Inventory* (BDI)												
Personal-Social	1	52.0	(26.4)	56.8	22	59.8	(26.5)	55.8	27	.17	.68	-.01
Adaptive Behavior	1	51.3	(26.0)	59.8	22	56.9	(24.9)	53.4	27	.44	.51	-.05
Motor	1	51.6	(29.2)	54.4	22	53.2	(28.3)	50.4	27	1.27	.27	-.14
Communication	1	43.2	(24.4)	45.9	22	51.5	(25.2)	48.8	27	.00	.99	.12
Cognitive	1	51.7	(28.4)	54.1	22	55.2	(28.3)	52.8	27	.68	.41	-.05
TOTAL		48.9	(24.4)	52.7	22	56.1	(25.7)	52.1	27	.32	.58	-.02
Vineland (DQs)												
Communication Domain	1	50.7	(28.7)	53.7	22	59.2	(29.6)	56.2	27	.15	.70	.09
Daily Living Domain	1	56.2	(28.6)	60.0	22	62.7	(28.1)	58.9	27	.04	.85	.04
Socialization Domain	1	51.1	(31.3)	54.4	22	58.1	(25.1)	54.8	27	.00	.95	.01

* Statistical analysis for BDI scores were conducted using ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

** Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

♦ Covariates: 1 = Mother Education

♣ SICD score represents the average number of months that the child's measured age of receptive and expressive speech deviates from their chronological age. Negative numbers indicate performance below age level.

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a difference found in the communication domain, and was, therefore, included as a covariate in all BDI analyses. Thus, pretest BDI, Total DQ, and maternal education were used as covariates in the ANCOVAs, with treatment groups (expanded intensity vs. standard intensity) as the independent variable and the Battelle DQs as dependent variables. No statistically significant mean differences were found on any of the child measures at any of the posttests. Although some fairly strong positive effect sizes were found in two BDI subdomains and one Vineland subdomain at third posttest, these differences disappeared at fourth posttest, suggesting that they may be only random variations.

Measures of Family Functioning

Posttest analyses of family functioning measures are presented in Table 4.13. Pretest scores indicated in the tables were included as covariates for posttest scores. The data indicate that families in the expanded group are functioning more like "ideal" families with respect to their adaptation and cohesion scores, but that they are more stressed and have less support than families in the standard intervention group. Table 4.13 indicates that only a couple of differences are statistically significant (i.e., FSS at second posttest, and FACES adaptation at fourth posttest), but there are large effect sizes on the PSI and FILE data favoring the standard group at fourth posttest, and nearly equally large effect sizes on the FACES adaptation and cohesion scores favoring the expanded group. Further analyses suggest that differences in stress scores are related to increased stressors measured by the FILE and to reduced family cohesion as measured by the FACES. That is, when the sample was divided into high and low stress groups, the low stress group reported lower FILE scores and cohesion scores that were closer to the "ideal" (as defined by McCubbin and Olson) on the cohesion scale of the FACES III.

Table 4.13

Posttest Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

		Standard Intensity					Expanded Intensity							
Variable	Covariate♦	x̄	(SD)	Adj. x̄	%ile	n	x̄	(SD)	Adj. x̄	%ile	n	ANCOVA F	P Value	ES~
POSTTEST #1														
Parent Stress Index (PSI)*														
Child Related	1,2,3	116.2	(26.2)	117.1	86	27	114.7	(23.6)	113.8	79	32	.76	.39	.13
Other Related	4,2,5	128.3	(30.6)	131.3	68	27	135.1	(28.6)	132.0	70	33	.03	.86	.02
TOTAL	6,2,3	244.4	(52.9)	249.4	79	27	248.3	(45.4)	243.3	74	32	1.09	.30	.12
Family Adaptation and♣ Cohesion Evaluation Scales (FACES)														
Discrepancy (range 0 to 80)	7,8,9	11.8	(11.1)	12.2		29	9.0	(6.7)	8.5		35	3.74	.06	.33
Adaptation (range 0 to 24)	10	5.5	(3.5)	5.4		29	4.6	(3.7)	4.7		36	.63	.43	.20
Cohesion (range 0 to 30)	11,8	5.5	(4.8)	5.3		29	4.1	(2.8)	4.3		36	1.54	.22	.21
TOTAL (range 0 to 54)	12	8.5	(4.6)	8.3		29	6.8	(3.7)	7.0		36	2.28	.14	.28
Family Resource Scale♠# (FRS)	13	113.0	(23.0)	112.8	40	28	115.5	(20.5)	115.7	48	37	.84	.36	.13
Family Support Scale♠# (FSS) - Mother	14	29.5	(14.1)	29.5	57	28	28.0	(13.8)	28.1	50	37	.29	.60	-.10
Family Index of Life Events (FILE)	7,5	7.8	(6.1)	8.9	47	28	11.3	(6.6)	10.6	40	34	1.33	.25	.28
POSTTEST #2														
Parent Stress Index (PSI)*														
Child Related	1,2	113.3	(28.6)	112.7	79	24	116.6	(27.0)	117.2	86	30	.70	.41	-.16
Other Related	3	124.6	(31.9)	128.0	63	24	137.6	(26.1)	134.3	72	32	2.38	.13	-.20
TOTAL	1,2	253.0	(65.5)	251.2	81	24	258.3	(48.5)	260.1	86	30	.47	.50	-.14
Family Adaptation and♣ Cohesion Evaluation Scales (FACES)														
Discrepancy (range 0 to 80)	2,5	14.8	(19.0)	15.5		26	10.9	(7.8)	10.3		33	2.62	.11	.27
Adaptation (range 0 to 24)	6	6.3	(3.5)	6.3		26	5.9	(3.8)	5.8		33	.29	.59	.14
Cohesion (range 0 to 30)	7	6.7	(4.3)	6.6		26	5.3	(3.4)	5.4		33	1.89	.18	.19
TOTAL (range 0 to 54)	7	9.9	(4.1)	9.8		26	8.4	(4.1)	8.5		33	2.01	.16	.32
Family Resource Scale♠# (FRS)	5,3,2	114.2	(26.8)	114.8	43	25	114.8	(16.0)	114.1	41	29	.03	.86	-.03
Family Support Scale♠# (FSS) - Mother	8,9	35.1	(15.7)	35.0	72	25	27.3	(11.1)	27.4	47	32	6.41	.01	-.48
Family Index of Life Events (FILE)	3,4	8.1	(7.2)	9.5	40	24	9.9	(7.7)	8.6	47	30	.41	.53	-.13

(continued)

~ Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses and Effect Size (ES) estimates for PSI and FILE were based on raw scores where low raw scores and positive ESs are most desirable. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. A low percentile score indicates low stress or a low number of stress-associated life events.

♣ Scores for each subscale of the FACES are derived from an "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the Expanded Intensity group performed better.

♠ Analysis for the FSS and FRS are based on raw scores, indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

[#] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretest collected as part of the longitudinal studies.

♦ Covariates: 1 = PSI Total; 2 = PSI Child; 3 = PSI Other; 4 = FILE; 5 = FRSE; 6 = FACES-Adaptation; 6 = FACES-Cohesion; 7 = FACET; 8 = FSS Total; 9 = FACED; 9 = Mother's Education

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Table 4.13 (continued)

Posttest Measures of Family Functioning for Alternative Intervention Groups for Arkansas Intensity Study

Variable	Covariate♦	Standard Intensity x̄	(SD)	Adj. x̄	%ile	n	Expanded Intensity x̄	(SD)	Adj. x̄	%ile	n	ANCOVA F	p Value	ES
POSTTEST #3														
Parent Stress Index (PSI)*														
Child Related	1	110.9	(26.1)	112.6	79	21	122.0	(38.6)	120.2	88	28	8.08	.19	-.29
Other Related	3	117.5	(26.1)	121.8	50	21	140.5	(32.7)	136.2	74	28	1.74	.24	-.55
TOTAL	1,2	227.7	(50.3)	228.2	60	21	256.8	(58.3)	256.3	84	26	5.46	.01	-.56
Family Adaptation and Cohesion Evaluation Scales (FACES)♣														
Discrepancy (range 0 to 80)	6	9.7	(7.5)	9.9		21	11.8	(9.8)	11.7		32	.55	.46	-.24
Adaptation (range 0 to 24)	7	6.0	(2.8)	5.8		22	5.0	(4.2)	5.2		34	.31	.58	.21
Cohesion (range 0 to 30)	9	5.4	(4.1)	5.4		22	4.1	(4.0)	4.1		34	1.38	.25	.32
TOTAL (range 0 to 54)	10	8.4	(4.3)	8.4		22	7.1	(5.0)	7.1		34	1.09	.30	.30
Family Resource Scale▲# (FRS)	5	119.7	(24.3)	120.4	54	22	115.1	(17.6)	114.4	41	34	1.55	.22	-.25
Family Support Scale▲# (FSS) - Mother	4	29.5	(14.4)	29.4	54	21	27.9	(12.2)	28.0	50	34	.20	.66	-.10
Family Index of Life Events (FILE)	8	7.2	(4.9)	7.9	55	19	10.3	(8.1)	9.8	40	32	1.08	.30	-.39
POSTTEST #4														
Parent Stress Index (PSI)*														
Child Related	6,7	109.1	(28.2)	108.8	74	21	120.5	(29.6)	120.8	89	25	5.02	.30	-.43
Other Related	3,5	118.8	(34.9)	119.6	48	21	136.9	(38.3)	136.2	74	23	3.97	.53	-.48
TOTAL		228.4	(60.1)	234.4	66	21	250.0	(61.2	244.0	75	25	.64	.43	-.16
Family Adaptation and Cohesion Evaluation Scales (FACES)♣														
Discrepancy (range 0 to 80)	8	9.6	(12.2)	9.5		22	11.4	(7.2)	11.5		26	.51	.48	-.16
Adaptation (range 0 to 24)	10	6.9	(5.1)	6.8		22	5.1	(3.7)	5.2		25	1.82	.18	.31
Cohesion (range 0 to 30)	9	7.7	(4.7)	7.9		22	4.3	(2.8)	4.1		25	13.26	.00	.81
TOTAL (range 0 to 54)	9,10	10.7	(6.3)	10.8		22	7.3	(3.3)	7.3		25	7.32	.01	.56
Family Resource Scale▲# (FRS)	3	119.5	(21.2)	119.3	51	22	118.0	(19.9)	118.2	50	27	.05	.83	-.05
Family Support Scale▲# (FSS) - Mother	1,2	31.9	(15.9)	32.0	66	22	28.9	(14.5)	28.8	54	23	.62	.43	-.20

Subgroup Analyses

Subgroup analyses concerning mother's years of education, children's health status, and teacher ratings of parent involvement have been conducted thus far. That is, children were divided into groups based on maternal completion or non-

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completion of high school, parental ratings of child health (as good as or worse than that of other children of the same age), and teacher ratings of level of parental involvement. Only parent involvement has been found to produce large effects, as described below. The results of the parental education and child health data analyses suggest that the developmental progress of the children in this study was not affected by either their parent's assessment of the child's health status or by parental completion of high school.

Regarding the parental involvement data, parents were rated as "highly involved" if their total teacher rating score ranged from 7 to 9 and those rated as "less involved" if their total score was 6 or less. Although differences found between these groups are not statistically significant, the effect sizes in three BDI domains (personal-social, communication, and cognition) were large at second and third posttest (average .41 and .30, respectively), favoring highly involved parents (Table 4.14). Average effect sizes in these domains at first and fourth posttest were unimpressive (.06 and .18, respectively). These varying effect sizes provide no clear direction as to cause and effect. It may be that parent involvement and child developmental outcome are related, but if there is a cause/effect relationship, the direction of that relationship is uncertain. This uncertainty is compounded by the fact that parents rated as more involved had children with more severe delays. It may also be that teacher ratings of parent involvement were related to child developmental progress or to their relationship with the parents. Unfortunately, we found no unbiased and reliable way of assessing parent involvement. Thus, it is not possible to draw conclusions from this finding.

Conclusions

The absence of statistically significant differences between groups should not be viewed negatively. Rather, it could be considered an indication that resources

Table 4.14

Posttest Measures of Child Functioning for Parent Involvement Groups for Arkansas Intensity Study

		Standard Intensity				Expanded Intensity						
Variables	Covariates[♦]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[~]
POSTTEST #1 CA (months)		35.5	(13.0)		38	35.6	(13.4)		29	1.07	.84	.00
Battelle Developmental Inventory[*] (BDI)												
Personal-Social	1	54.8	(18.1)	51.2	38	45.5	(26.6)	49.2	29	.30	.59	-.11
Adaptive Behavior	1	61.0	(20.1)	55.3	38	46.0	(30.1)	51.8	29	.77	.38	-.17
Motor	1	62.4	(25.5)	55.1	38	42.5	(28.7)	49.7	29	1.48	.23	-.21
Communication	1	53.0	(21.0)	47.8	38	45.9	(33.0)	51.2	29	.49	.49	.16
Cognitive	1	59.1	(22.5)	52.5	38	48.6	(34.2)	55.2	29	.40	.53	.12
TOTAL	1	58.2	(18.0)	52.8	38	45.1	(28.3)	50.5	29	.61	.44	-.13
Pretest BDI Total DQ	1	57.6	(19.3)		38	42.9	(29.8)		29	2.47	.01	-.76
POSTTEST #2 CA (months)		45.6	(13.7)		35	45.8	(13.0)		24	1.11	.80	.01
Battelle Developmental Inventory[*] (BDI)												
Personal-Social	1	57.9	(23.6)	51.2	35	51.2	(36.0)	57.9	24	4.00	.05	.28
Adaptive Behavior	1	60.0	(24.1)	51.2	35	42.3	(28.7)	51.1	24	.00	.99	-.00
Motor	1	61.3	(28.3)	51.3	35	37.0	(29.0)	47.0	24	.53	.47	-.15
Communication	1	50.8	(23.8)	41.6	35	42.1	(29.6)	51.3	24	4.38	.04	.41
Cognitive	1	55.8	(25.8)	45.3	35	44.8	(34.9)	55.3	24	3.81	.06	.39
TOTAL		56.9	(21.8)	47.9	35	43.2	(29.2)	52.3	24	1.30	.26	.20
Pretest BDI Total DQ		58.2	(19.9)		35	37.9	(27.7)		24	3.27	.00	-1.02
POSTTEST #3 CA (months)		58.4	(14.1)		32	59.2	(13.9)		23	1.04	.95	.06
Battelle Developmental Inventory[*] (BDI)												
Personal-Social	1	58.3	(23.8)	51.6	32	51.4	(38.5)	58.1	23	.92	.34	.27
Adaptive Behavior	1	62.8	(26.0)	54.1	32	42.3	(32.6)	51.0	23	.33	.57	-.12
Motor	1	57.9	(27.0)	47.1	32	42.3	(36.7)	53.0	23	.88	.35	.22
Communication	1	50.4	(22.3)	42.8	32	42.3	(32.9)	49.8	23	1.58	.21	.31
Cognitive	1	58.5	(26.1)	47.7	32	45.4	(37.2)	56.1	23	1.89	.18	.32
TOTAL		57.3	(22.5)	48.5	32	43.8	(32.8)	52.7	23	.68	.41	.19
Pretest BDI Total DQ	1	59.5	(18.8)		32	40.0	(31.6)		23	2.83	.01	-1.04
POSTTEST #4 CA (months)		68.7	(14.5)		28	69.2	(15.5)		20	1.15	.72	.03
Battelle Developmental Inventory[*] (BDI)												
Personal-Social	1	59.5	(21.4)	54.8	28	51.8	(32.9)	56.5	20	.09	.76	.08
Adaptive Behavior	1	61.0	(22.1)	55.8	28	45.0	(27.6)	50.2	20	.36	.25	-.25
Motor	1	58.3	(24.8)	52.2	28	44.0	(32.2)	50.1	20	.10	.75	-.08
Communication	1	49.2	(20.2)	43.3	28	44.8	(31.0)	50.6	20	1.80	.19	.36
Cognitive	1	58.3	(23.0)	51.2	28	46.4	(33.9)	53.4	20	.14	.72	.10
TOTAL		56.8	(19.9)	51.2	28	46.4	(29.8)	52.0	20	.03	.86	.04
Pretest BDI Total DQ	1	59.3	(19.4)		28	43.7	(31.4)		20	2.62	.02	-.80

[*] Statistical analysis for BDI scores were conducted using ratio Development Quotients (DQs) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[~] Effect Size (ES) is defined here as the difference between the group (Expanded minus Standard) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation (see Glass, 1976/ Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[♦] Covariates: 1 = Mother Education

spent providing home visits twice instead of once per week could be better spent in other areas. This is important information for both service providers and parents.

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This study fails to support the efficacy of expanding home visit services from once to twice per week. Although larger frequency differences are not addressed, children in the first cohort did receive one year of service at an approximately 3:1 ratio (based on attendance data; see Table 4.5). Dividing the sample into groups with more and less severe disabilities also failed to produce statistically significant differences. This finding casts still more doubt on the conventional wisdom that more frequent home visits are more effective than less for children with severe disabilities.

Findings from the analysis of parent involvement data gathered in this study are ambiguous given the decline in effect sizes observed at fourth posttest (Table 4.14), but the effect size data do suggest that this may be an area worthy of further investigation. Serious consideration should be given to the Sandow et al. (1981) recommendation that intervention be more intense when it is first delivered and be tapered off as parents gain skill and comfort with their own abilities. This recommendation is based on the findings of Sandow and her colleagues and of Barrera et al. (1986). Barrera et al. found that children who were most at-risk achieved significantly larger cognitive gains than children who were less at-risk (as determined by birth weight). Barrera et al. suggested that intervention efforts target children and families who are at serious risk because these families may be more receptive to intervention. These investigators appeared to be following the advice of Sandow et al. by conducting home visits weekly for the first three months, every other week for the next six months, and once a month for the last three months of the first year.

Future investigators should attempt to get parent involvement data from several sources (e.g., parents, professionals, and school records) and analyze these data both separately and in combination relative to their impact, or lack of impact, on child development.

NEW ORLEANS ASSOCIATION FOR RETARDED CITIZENS

Project #5

COMPARISON: Severely Handicapped Infants--Center-based developmental intervention delivered by paraprofessionals trained through an inservice model vs. the center-based developmental intervention delivered by paraprofessionals trained through an intensive, in-classroom model.

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LOCATION: New Orleans, Louisiana

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Rationale for the Study

There is a chronic and critical shortage of certified personnel in early childhood special education (McLaughlin, Smith-Davis, & Burke, 1986). This shortage is especially acute in rural and inner-city areas (Huntington, 1988; McLaughlin et al., 1986). With the passage of P.L. 99-457, this shortage will likely increase as early childhood intervention programs grow to provide services to a greater number of children. At present, partly as a result of this shortage, it is not uncommon to have noncertified personnel providing services to young children with disabilities (Huntington, 1988; Teaching Resources, 1985; Weiner & Koppelman, 1987). The possibility of using noncertified individuals, supervised by appropriately trained and certified/licensed personnel, as interventionists in early childhood programs has been discussed as an appropriate and feasible strategy

(Innocenti & White, 1988; Peters & Deiner, 1987). In fact, Head Start, the largest provider of early intervention services in the United States, is primarily staffed by trained paraprofessionals. A question raised by this strategy for staffing early intervention programs is what levels of training and support are required for these noncertified individuals to deliver effective services (Peters & Deiner, 1987). The purpose of this study was to determine whether the addition of systematic training, ongoing technical support and assistance, and expanded materials and equipment to a program that used noncertified personnel as interventionists would result in enhanced child growth and improved family functioning when compared with the existing program.

Review of Related Research

For the purposes of this report, noncertified personnel will be referred to as paraprofessionals and defined as any individual, including those with a university degree and/or formal certification, who is providing services to a child in an area in which he/she is not specifically certified (Pezzino, 1984). Research on the effectiveness of paraprofessionals has demonstrated that paraprofessionals can teach new skills to children with disabilities (Fredericks, Baldwin, Moore, Templeman, & Anderson, 1980; Guess, Smith, & Ensminger, 1971; Phillips, Liebert, & Poulos, 1973; Schortinghais & Frohman, 1974; Shearer & Shearer, 1972). A difficulty with the majority of this research is that intervention vs. no intervention was compared; therefore, it is difficult to determine whether paraprofessional training procedures result in intervention that is any better for children and families than what they would have received in the absence of special training to the paraprofessional.

The most commonly used training procedures for paraprofessionals consists of orientations and inservice sessions (Frith & Lindsey, 1982). Research studies investigating these common approaches generally provide information only on changes in teacher knowledge and attitudes (Farrell, 1982; Johnson & Ferryman, 1969).

Information that has been presented on teacher behavior as a result of this inservice, classroom-type training has not been positive (Farrell, 1982). Data on how these teacher changes affect the children with whom they are working is usually not presented.

An alternative to this inservice training model for paraprofessionals is the therapy or collaborative consultant model (Striefel & Cadez, 1983). With this model, a certified professional provides the assessment of the child with a disabilities and outlines the programming to be given. The professional trains the paraprofessional in the implementation of a program and in data collection practices until the paraprofessional meets a specified criteria. The paraprofessional then assumes responsibility for the program. The professional makes regular contacts with the paraprofessional to observe the implementation of the program, provide feedback (and retraining if necessary), check the program data, and make program changes as needed.

A variation of the therapy consultant model was used by the Social Integration Project (SIP) to provide services to children who were disabled and were placed in an integrated daycare center where the primary teaching staff were paraprofessionals (Rule, Killoran, Stowitschek, Innocenti, & Striefel, 1985; Rule et al., 1987). Children with disabilities in SIP demonstrated significant skill increases while in the program, and paraprofessional attitudes were positive toward the program (Rule et al., 1987). Children in the SIP program were also compared to matched children in a professionally staffed intervention program (Rule et al., 1987). Results indicated no difference between programs on measures of child functioning.

The results of the studies reviewed above suggest that paraprofessionals can be effective intervention agents. A variety of training procedures for paraprofessionals have resulted in children making development gains, but comparative studies of different training procedures are rare. A comparative study of a paraprofessional versus a professional implemented intervention program found no difference in child functioning (Rule et al., 1987). Unfortunately, this study was confounded in that the paraprofessionally implemented program was mainstreamed (it occurred in a daycare setting that mixed children with and without disabilities) and the other was not; children were matched and not randomly assigned to groups, and the size of the subject sample was small.

The current study partially replicated the Rule et al. (1987) study while avoiding some of the confounds they encountered. Random assignment was used to assign subjects to groups, and a larger subject sample was employed. Another difference from the Rule et al. study is that this study compared the effect of two different methods of training paraprofessionals (variation of the consultant versus the inservice model) on child and family functioning. A final difference is that this research occurred in an inner-city intervention program, an identified personnel shortage area (McLaughlin et al., 1986), rather than a suburban setting.

Overview of Study

This study contrasted a commonly-used paraprofessional service and training model with a paraprofessional service model that included a more intensive training component in a center-based, inner-city service program. The purpose of this study was to provide information on the effect of these different training procedures on intervention success as measured by child and family functioning, while also considering cost-effectiveness data. The Association for Retarded Citizens (ARC) in New Orleans provided center-based developmental intervention services for children with disabilities from birth to 3 years of age living in the inner-city area. Paraprofessional staff who were trained through monthly inservice sessions and had limited supervision or contact with professional personnel implemented the program. The ARC was separated into two programs for this study. One program carried on without change (basic program). In this program, staff continued to receive monthly inservice sessions. The other program was augmented through training from professionals using a variation of the therapy consultant model. Training for the augmented program focused on increasing the structure of the program by teaching systematic intervention strategies, by providing ongoing technical assistance and support, and by providing expanded materials and equipment.

Results from the study provide important information in a number of areas not usually addressed.

1. Although the primary focus was on child growth, benefits to the family were possible, and measures of family functioning were obtained. Family functioning has been an overlooked area of early intervention research in the past (Casto & Mastropieri, 1986; Dunst, 1986).
2. Under P.L. 99-457, many programs will have to engage in training and certification of some type with their noncertified personnel to come into compliance with the law (Innocenti & White, 1988; Peters & Deiner, 1987). Knowledge regarding the efficacy of various training methods will be needed.
3. The ARC program was very typical of what now exists in many rural and inner-city programs (Huntington, 1988; Teaching Resources, 1985).
4. As cost-effectiveness data from different approaches will be important for making administrative decisions, that data was also collected.

Methods

This study was conducted in conjunction with the New Orleans Association for Retarded Citizens (ARC), a nonprofit, United Way agency affiliated with both the National ARC and Louisiana ARC. At the time of the study, the ARC was governed by a board of directors composed of experts in the field of education for the disabled, consumers of the services, and people in the community. Funding for the ARC came from United Way and the Louisiana Office of Mental Retardation and Developmental Disabilities. When this study was conducted, the ARC was the largest provider of services to 0- to 3-year-old children with disabilities in the New Orleans area. Three ARC-operated centers provided services to children (the Main, Jefferson, and West Bank sites) as well as operating a work activities center for adults with disabilities at the Main site.

The intervention programs studied as a part of this project was a 5-day-per-week, center-based program that operated from 9:00 a.m. to 3:00 p.m. During the first year of the study (1986-87), two classrooms at the Jefferson and West Bank sites, and three classrooms at the Main site participated in the research. At each site, teachers were randomly assigned to either a basic or augmented classroom. During the second year (1987-88), only two of the sites (Main and West Bank) participated in the research due to internal changes at the ARC. Six classrooms from these two sites participated (four classrooms at Main). Classrooms remained in the basic or augmented group dependent on the teacher's previous year assignment. The classroom and teacher new to the study at the Main site was designated an augmented classroom.

Due to delays in starting the research program, the first year of intervention was 6 months in length. The study began late in January 1987 and continued to August 1987. The second year of intervention coincided with the traditional academic year, from September 1987 to May 1988 (9 months).

Subjects. As shown in Figure 5.1, subjects were enrolled in the study in two different years. Forty-five children (24 basic, 21 augmented) between 10 and 34 months of age (mean = 23.7) participated in the first year of the study. Of these 45 subjects, 31 "graduated" to preschool programs operated by the local school districts at the end of the first year. The remaining 14 (8 basic, 6 augmented) continued in classrooms of their assigned group.

During the second year, 19 new subjects (8 basic, 11 augmented) began participation in the research. Ages of these subjects ranged from 12 to 32 months (mean = 23.0).

The primary analyses for this report is on all subjects who have received interventions. This includes subjects who have received 6, 9, and 15 months of intervention. This group consisted of 64 subjects (32 basic, 32 augmented) ranging in age from 10 to 34 months (mean = 23.3) when they began intervention. Thirty-five

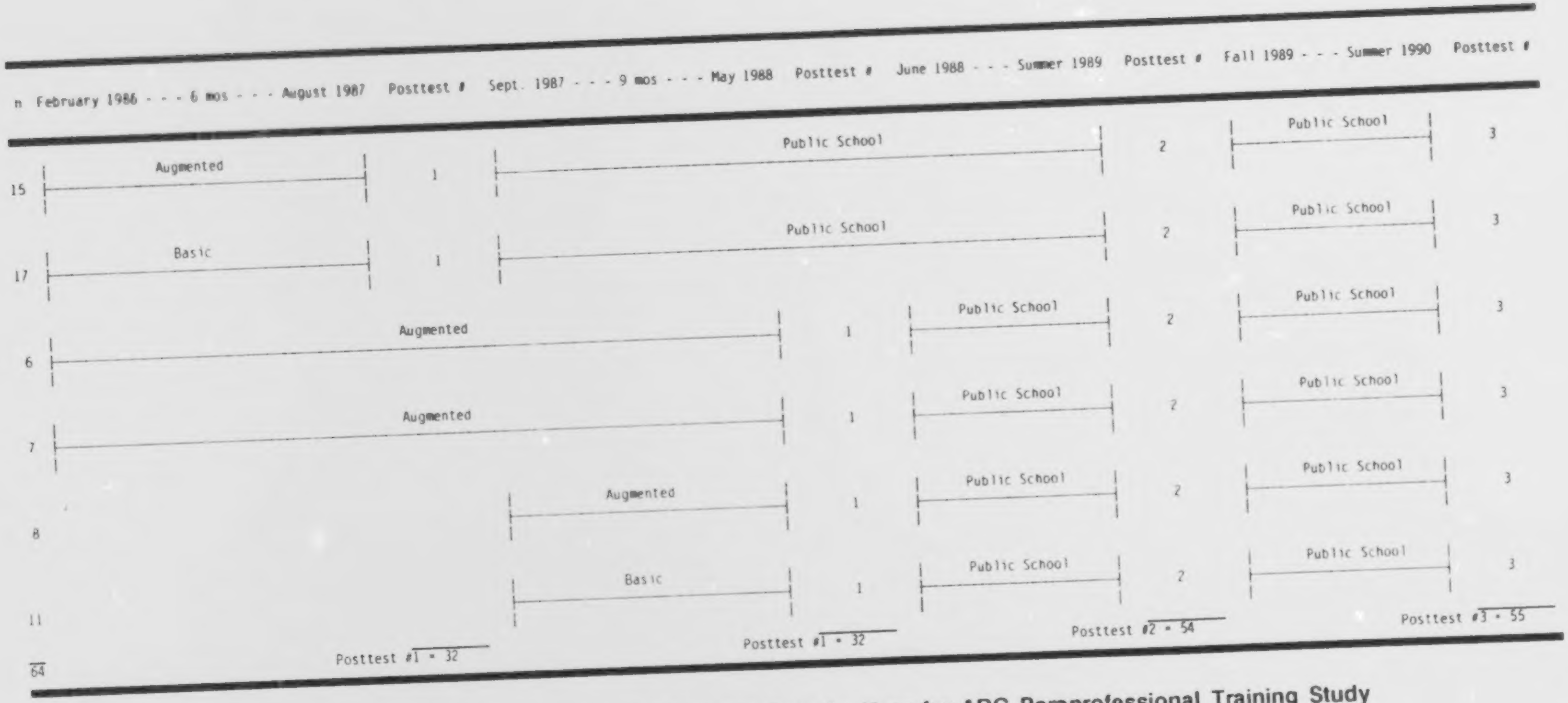

Figure 5.1: Number of Subjects, Group Placement, and Posttest Data by Year for ARC Paraprofessional Training Study

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were male. The age equivalents for the children, based on the total score of the Battelle Developmental Inventory (BDI), ranged from 0 to 27 months (mean = 5.6; SD = 10.9). The majority of these children had moderate to severe disabilities. Using a developmental quotient calculated by dividing BDI total age equivalent by chronological age and then multiplying by 100, 78% of the children had developmental quotients below 65. Almost half (48%) of the children had developmental quotients below 50.

Recruitment. The criterion the ARC used to identify a child as disabled was established by the Louisiana Office of Mental Retardation and Developmental Disabilities. This criteria qualified a child as disabled if he/she exhibited a mild delay in two or more developmental areas, a severe delay in one or more developmental area, or had a condition diagnosed by a physician that may lead to life-long developmental delays. The majority of children identified for service at the ARC had more involved disabilities; for example, 17 children in the study had Down syndrome, 8 had cerebral palsy, and 9 were multiply disabled (the degree of involvement was also indicated by the developmental quotients of the children, as will be reported later).

All children and their families who were identified as disabled and were scheduled to participate in the ARC program were considered for inclusion in the study. Services at the ARC were provided on a first come, first serve basis until all slots were filled. From this pool, subjects were included in the study based upon parents' willingness to participate prior to knowing to which treatment group they would be assigned. Informed consent to participate in this study was obtained from the parents. Parent failure to provide informed consent did not exclude a child from receiving services at the ARC.

Assignment to groups. Random assignment of teachers to classes (discussed earlier) was accomplished with coded information so that knowledge of which teacher was associated with which class was not known during subject assignment. The children at each site were categorized by 6-month age groupings. Independently, another set of researchers, who were familiar with the children's disabilities, categorized children into three functional levels ranging from least to most impaired. Based on these categorizations, children were paired by functional level within age category (a 5 x 3 matrix). If pairings were not possible using this procedure, children within the same age categories were paired with children in an adjacent functional level category. If that procedure was not possible, children within the same functional level categories were paired within adjacent age categories. After all pairings were accomplished, a random procedure (coin toss) was implemented to assign one member of each pair to the basic condition and the corresponding pair member to the augmented condition.

During the second year, a similar procedure was followed. At each site, an age by functioning matrix was developed. This resulted in a 4 x 3 matrix, as only one child (a 12-month-old) was in the 0- to 12-month age range, and the 13- to 18-month grouping was expanded to include this subject. Subjects continuing from the first year were placed in their assigned groups within the matrix. The remaining subjects were randomly assigned to complete matrix pairings.

Attrition. In the first year (1986-87), 46 subjects participated in the study. One child (augmented) moved from the area during intervention and transferred to another program. Twenty-three subjects were pretested and began study participation at the beginning of the second year (1987-88). Four subjects (two basic, two augmented) withdrew from the study during the year. These subjects withdrew from all ARC program participation due to individual family problems. These five children were not posttested and are not included in analyses for this study, leaving 64 children in the Posttest #1 analysis.

54 children were tested for Posttest #2. Intensive efforts to locate all the children were undertaken and included phone calls and visits to last known address

and contacting next of kin. These efforts were successful with 54 of the 64 subjects.

Two of the children not posttested in the 2nd year of follow-up were posttested in the third and last year of follow-up, and one child tested for Posttest #2 could not be located. This resulted in a total of 55 subjects for Posttest #3 analysis.

Demographic characteristics. Three posttests of the subjects were completed. Each posttest involved a slightly different set of subjects due to attrition and mobility of the families in the study. Tables 5.1 to 5.3 present demographic differences between the groups for each of the three posttest samples and are discussed below.

There Posttest #1 demographic data show that approximately 72% of the subjects in this study are Black. The majority come from low SES families; 60% of subjects reported annual incomes below $10,000. Approximately 45% of subjects come from families where both the mother and father live at home. Demographic characteristics for all children in the research are presented by group placement in Table 5.1. This table presents information on the comparability of groups. Probability values were obtained from t-tests.

Of the 17 variables presented, three (age of father in years at pretest, percent with both parents living at home, and percent of children who are Caucasian) approach being statistically significant at the $p \leq .05$ level. By examining the data on all variables, it appears that the groups are very comparable in terms of demographic characteristics. If there is any advantage between the two groups, it would be slightly in favor of the augmented group where percent with both parents living at home, percent of children who are Caucasian, and percent of mothers employed as technical/managerial or above is slightly but not statistically significantly higher.

Table 5.1

Comparison at Posttest #1 of Groups on Demographic Characteristics for Subjects Receiving One and Two Years of Intervention for ARC Paraprofessional Training Study

	Basic Program			Augmented Program			p Value	ES^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Age of child in months at pretest	23.7	(6.5)	32	23.0	(7.2)	32	70	-.11
• Age of mother in years' at pretest	27.6	(7.4)	32	29.6	(7.3)	32	30	.27
• Age of father in years' at pretest	30.4	(6.2)	27	33.6	(7.8)	26	.11	.52
• Percent Male*'	53.1		32	56.3		32	81	.06
• Years of Education--Mother	11.9	(2.1)	32	12.6	(1.9)	32	22	.33
• Years of Education--Father	12.0	(2.0)	30	12.6	(2.3)	27	.23	.30
• Percent with both parents living at home*	31.3		32	53.1		32	08	.45
• Percent of children who are caucasian*	18.8		32	37.5		32	.10	.42
• Hours per week mother' employed	13.7	(18.8)	31	9.1	(16.3)	32	.31	-.24
• Hours per week father' employed	39.7	(9.1)	19	40.0	(19.8)	18	.96	.03
• Percent of mothers employed as technical managerial or above*	9.4		32	21.9		32	.17	.35
• Percent of fathers employed as technical managerial or above*	25.0		24	17.4		23	.53	-.18
• Median household income	$4,500	($20,694)	30	$4,500	($19,418)	30	.97	.01
• Percent with mother as primary caregiver*	90.9		22	92.3		26	87	.05
• Percent of children in daycare more than 5 hours per week*	59.4		32	71.0		31	34	.24
• Number of siblings'	1.2	(1.4)	32	0.9	(0.9)	32	.33	-.21
• Percent with English as primary language*	100		31	96.9		32	.99	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

' Effect sizes for these variables represent absolute values.

^ $\frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$

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Table 5.2

Comparison of Groups at Posttest #2 on Demographic Characteristics for Subjects Receiving One and Two Years of Intervention for ARC Paraprofessional Training Study

	Basic Program			Augmented Program				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
• Age of child in months at Pretest	23.2	(7.1)	25	22.8	(7.6)	29	.84	-.06
• Age of mother in years' at pretest	28.5	(7.8)	25	29.3	(7.0)	29	.67	.10
• Age of father in years' at pretest	30.9	(6.5)	22	33.5	(6.7)	23	.20	.40
• Percent Male*'	52		25	59		29	.63	.12
• Years of Education--Mother	12.0	(2.1)	25	12.6	(2.0)	29	.36	.29
• Years of Education--Father	11.7	(2.1)	24	12.6	(2.4)	25	.16	.43
• Percent with both parents* living at home	36		25	55		29	.17	.36
• Percent of children who* are Caucasian	20		25	38		29	.16	.36
• Hours per week mother' employed	14.2	(19.4)	25	10.1	(16.9)	29	.40	.21
• Hours per week father' employed	38.4	(8.6)	15	41.1	(19.8)	17	.61	.31
• Percent of mothers* employed as technical managerial or above	12		25	24		29	.26	.27
• Percent of fathers* employed as technical managerial or above	25		20	20		20	.71	.10
• Mean household income	$16,580	($22,283)	25	$18,167	($19,875)	27	.79	.07
• Percent with mother as* primary caregiver	100		17	91		23	.46	.23
• Percent of children in* daycare more than 5 hours per week	52		25	71		28	.15	.37
• Number of siblings'	1.2	(1.3)	25	1.0	(.9)	29	.39	.20
• Percent with English* as primary language	100		24	97		29	.67	.11

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

['] Effect sizes for these variables represent absolute values.

[^]
$$\frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$$

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Table 5.3

Comparison of Groups at Posttest #3 on Pretest Demographic Characteristics for Subjects Receiving One and Two Years of Intervention for ARC Paraprofessional Training Study

	Basic Program			Augmented Program				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months at pretest	23.2	(6.8)	27	23.1	(7.5)	28	.97	.01
• Age of mother in years' at pretest	28.7	(7.3)	27	29.5	(7.0)	28	.67	.11
• Age of father in years' at pretest	31.0	(6.2)	23	33.5	(6.7)	22	.20	.40
• Percent Male*'	.5		27	.4		28	.51	.18
• Years of Education--Mother	12.1	(2.1)	27	12.6	(2.0)	28	.34	.24
• Years of Education--Father	11.8	(2.1)	25	12.7	(2.4)	24	.17	.43
• Percent with both parents living at home*	.3		27	.5		28	.14	.44
• Percent of children who are caucasian*	.2		27	.4		28	.09	.50
• Hours per week mother' employed	15.7	(19.4)	27	9.0	(16.1)	28	.17	.35
• Hours per week father' employed	38.5	(8.3)	16	39.3	(20.9)	16	.89	.10
• Percent of mothers employed as technical managerial or above*	.1		27	.2		28	.31	.31
• Percent of fathers employed as technical managerial or above*	.3		20	.2		19	.78	.09
• Mean household income	$15,685	($21,657)	27	$17,462	($20,161)	26	.76	.08
• Percent with mother as primary caregiver*	1.0		20	.9		22	.62	.18
• Percent of children in daycare more than 5 hours per week*	.5		27	.7		27	.17	.35
• Number of siblings'	1.2	(1.4)	27	.9	(.9)	28	.31	.24
• Percent with English as primary language*	1.0		26	1.0	(.2)	28		.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

' Effect sizes for these variables represent absolute values.

^ $\dfrac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$

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It should be noted that parents in this study come primarily from low-income areas, and some attempts at providing information that meet parent expectations of what the site staff would like to see, rather than actual information, may have occurred to some degree. Demographic questions related to income, occupation, and other potentially "sensitive" variables were left unanswered by some parents. Also, in families where both parents were not living at home, information on fathers was difficult to obtain.

The demographic profile of the subjects in the two comparison groups at Posttest #2 is very similar to the demographic profile for Posttest #1 (see Table 5.2). In fact, groups at Posttest #2 show fewer intergroup differences than at the earlier posttest.

Data regarding differences between the groups for subjects included in the Posttest #2 and Posttest #3 analyses are presented in Tables 5.2 and 5.3 respectively. Similar to Posttest #1, the majority come from Black, low-income families. The demographic variables suggest very similar groups overall for the three posttest groups of subjects.

Intervention Programs

The ARC offered two types of early intervention programs for young children who were developmentally delayed: (a) 5-day-per-week, center-based program that operated from 9:00 a.m. to 3:00 p.m.; and (b) an infant service program that provided 1 hour of intervention per week to infants with disabilities and their families at one of the three ARC sites. All children involved with the EIRI research were in the center-based program.

In the center-based program, the typical classroom organization contained eight children served by a teacher and aide. Teachers and aides were paraprofessionals; most teachers had a bachelor's degree, but none had teacher certification (see Table 5.4). Prior to the participation of the ARC in the EIRI research, classroom staff

Table 5.4

Educational and Teaching Experience of Teachers Involved in the ARC Paraprofessional Training Study

	Classroom Site	Education	College Major	Years Experience at ARC	Years in Study
BASIC CONDITION:					
Teacher #1	Main	Bachelor's Degree	Education	5	2
Teacher #2	Main	Bachelor's Degree	Home Economics	7	2
Teacher #3	Jefferson	Bachelor's Degree	Education	12	1
Teacher #4	West Bank	High School Diploma	**	10	2
AUGMENTED CONDITION:					
Teacher #5	Main	3 Years of College	**	10	2
Teacher #6	Main	3 Years of College	**	17	1
Teacher #7	Jefferson	Bachelor's Degree	Early Childhood	1	1
Teacher #8	West Bank	Bachelor's Degree	Early Childhood	3	2

* Major not presented unless teacher had a Bachelor's Degree

received training through general, agency-wide inservice sessions (see Table 5.5). Child goals and objectives were determined by consultants in the areas of speech and language and motor therapy, but these consultants interacted minimally with each other or with the classroom staff. Instructional activities occurred throughout the course of the day, but the quality and quantity of these activities varied.

Table 5.5

Inservice Topics Presented to Teacher and Aides in ARC Paraprofessional Training Study

Academic Year	Total Inservice Hours	Topics
86/87	10	First Aid, CPR, Diabetes, Medications, Seizure Disorders,
87/88	20	Hearing Impairments, Classroom Materials, Prenatal Development, Physical and Motor Development, Infection Control, CPR, P.L. 99-457, Transition and Advocacy.

Research at the ARC investigated two different methods for training paraprofessional teachers to work effectively with young children with disabilities. The interventions consisted of a continuation of services as they had been provided in the past where classroom staff received training through inservice sessions versus an augmented condition in which teachers and aides received in-classroom training from professional consultants who held a nationally recognized certification (teacher certification, CCC, OTR, etc.) and who had experience in early intervention. Tables 5.4 and 5.5 present information on the experience of teachers who were involved in the study and the inservices received, by classroom assignment of teachers in both conditions, while the study was occurring.

Basic intervention program. In the basic intervention program, classroom practices were similar to those that were in effect prior to beginning the study and are similar to those described above. Paraprofessional classroom staff received a series of topical workshops throughout the course of the school year (see Table 5.5). As described, classroom staff in the basic intervention program had minimal contact with the professionals who recommend specific goals for children. A multidisciplinary therapy model was used that did not focus on staff communication. Teachers and aides were not trained in the implementation of specific curricula or in the implementation of specific child programs. For staff in the basic intervention program, no procedures for providing feedback on their child programs or on specific teaching techniques was available.

Children in these classrooms received Individual Habilitation Plans (IHPs) developed by teachers based on professional recommendations and on a teacher-administered criterion-referenced instrument (Harrison County checklist). Instructional activities were generally structured in a one-to-one teaching format.

Instructional activities occurred throughout the day, but no daily systematic learning plans were available. This created variability in the types and frequency of instruction that occurred within a class and across classrooms. The lack of a systematic strategy resulted in teaching practices that would not be considered "best practice" in special education. For example, instructional activities that were implemented in the basic classes were often not related to child goals, child progress through instructional sequences were often not data based, and appropriate teaching techniques were not consistently applied. Educational materials existed in these classrooms, but were not adequate to meet all child development goals.

The teacher for each classroom established a daily schedule where activities were listed by general developmental areas; for example, gross motor time, fine motor time, cognitive time, etc. Activities that occurred during this time were teacher dependent. Some individualized activities occurred, but not systematically. During times when teachers worked individually with a child, no planned activities occurred for the other children.

Augmented intervention program. The experimental intervention, referred to as the augmented intervention program, involved the employment of a collaborative consultation model in the classrooms. Subjects attended ARC classrooms, staffed by similarly qualified staff, on the same days and for identical hours as subjects in the basic condition. For classrooms in this condition, the paraprofessional staff received training from professionals in their classroom throughout the school day. Professionals were from an interdisciplinary team from the Louisiana State University (LSU) Human Development Center. The professionals worked with classroom staff two to three times per week helping them to design and implement child-specific programs. Professional staff were certified and experienced in infant early intervention.

Classroom staff were directly instructed in the purposes of various child objectives, were taught teaching strategies needed to meet specific objectives, and were provided regular feedback on their teaching techniques. The focus of teaching activities was on teaching children needed skills during naturally occurring classroom routines (i.e., incidental teaching methods during snack, music, free play, etc.; c.f., Haring & Innocenti, 1980). Child IHPs were collaboratively developed by classroom staff and professionals. In addition, materials and equipment needed to meet specific child and group goals or for various classroom activities were provided as necessary. This equipment included such items as: (a) adaptive equipment for children with physical disabilities; (b) materials for specific programs (such as language cards, adapted bowls and spoons); (c) developmentally appropriate toys, where needed; and (d) additional food items to be used at snack times to aid in the implementation of incidental teaching programs.

Classroom staff in the augmented intervention program were trained in the use of a specific curriculum (Louisiana Curriculum for Infants with Handicaps) that included activities to meet objectives, as well as in adapting curriculum for specific child needs. The majority of instruction in this condition was provided through group individualized formats. That is, although children were primarily in group settings, specific child skills were focused on within these settings so each child received instruction appropriate to his/her skills and needs. The Individualized Curriculum Sequencing Model (Guess & Helmsletter, 1986) served as a framework for instructional activities.

Treatment Verification

A number of procedures were incorporated to verify that the interventions were being implemented as intended. Table 5.6 presents some of these data. One method to verify that treatment was received was to collect child attendance data during the intervention. If a child did not attend a program regularly, then evaluating treatment effectiveness was confounded by their absence. Daily records on attendance were kept by ARC staff, and these records were forwarded to EIRI on a monthly basis. In addition to the attendance data, general health data on the children were also collected. Health factors can potentially effect child progress. No differences

Table 5.6

Treatment Verification Data for ARC Paraprofessional Training Study and Services Obtained Outside ARC Program

Variable	Basic			Augmented			p Value	ES[^]
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
POSTTEST #1								
• General health of child[a]	1.9	(0.6)	31	1.9	(0.6)	31	.83	.00
• % child attendance	71.1	(21.0)	32	77.9	(12.7)	32	.12	.32
• Parent Satisfaction[']	24.1	(3.8)	32	23.4	(3.5)	27	.52	-.18
• Teacher rating of[*] parents	6.4	(2.3)	32	7.1	(2.1)	32	.27	.30
• Percent of children['] who received outside speech therapy	6.9		29	3.6		28	.58	-.15
• Percent of children['] who received outside motor therapy	32.1		28	25.0		28	.56	-.15
POSTTEST #2								
• General health of child[a]	2.9	(0.6)	25	1.9	(0.5)	29	.94	.02
• Percent of children['] who received outside speech therapy	20.0		25	10.3		29	.33	-.24
• Percent of children['] who received outside motor therapy	32.0		25	31.0		29	.94	-.02
POSTTEST #3								
• General health of child[a]	1.9	(0.6)	26	2.0	(0.5)	27	.59	.14
• Percent of children['] who received outside speech therapy	18.5		27	28.6		28	.39	.21
• Percent of children['] who received outside motor therapy	37.0		27	25.0		28	.34	-.24

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[a] Based on a parent rating of the child's health where: 1 = worse than peers; 2 = same as peers; 3 = better than peers.

['] Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[*] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

['] Data are based on parent report, obtained at posttest, of child time in the service during the past year, obtained outside of the ARC program

[^] $$ES = \frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$$

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were found between the groups on either attendance at Posttest #1 or health factors for any of the three posttest comparison groups (Table 5.6).

Many of the EIRI studies have an extensive treatment verification component that is related to parents. This emphasis on parents was minimal in this study. Parents of subjects were not required to be involved in their child's education except for attendance at one IHP, meeting and children were transported by the program to and from school. This programs' de-emphasis on parents, along with related demographic factors (i.e., many parents did not have phones, project staff were prohibited from visiting federal housing projects for work-related activities, etc.), made obtaining parent related data difficult. Parent satisfaction with the intervention program was obtained. These data are presented in Table 5.6. Parents in both groups were equally satisfied with their child's program.

Teachers were also asked to rate their perceptions of each child's parents on dimensions of support, knowledge, and attendance. Because this rating was based on very limited contact between parent and teacher, these ratings should be interpreted with caution. Teachers' ratings of parents at the ARC did not result in group differences (Table 5.6), and most parents were positively rated.

Parents were free to access other services that were available in the community. However, since there were few services available, relatively few children participated in such programs. Information was obtained from parents at each of the three posttests on the quantity of services subjects received outside the ARC intervention. Parent reports of additional services did not result in the funding of group differences for the three posttests reported in Table 5.6.

Site review. An important aspect of treatment verification is the site review. The purpose of this review was to collect information about the nature and quality of early intervention services that were being delivered at the ARC, to verify that the research being conducted by EIRI was being implemented as intended, and to collect needs assessment data that may be useful to site administrators when seeking technical assistance.

The first site review was conducted April 24, 1987. The ARC was found to be complying with EIRI research expectations. Specific areas were reviewed, and clear differences between basic and augmented conditions were found. For interested readers, greater detail is given in the site review report available from EIRI.

The second site review was conducted on April 26 and 27, 1988 (a site review report is available). The process differed for this second review in two major respects: (1) The review team included a member not affiliated with EIRI, but a person who was familiar with early intervention practices (David Sexton, Professor and Chair of Special Education, University of New Orleans); and (2) instead of treating the ARC as one program, the basic and augmented conditions were evaluated as if they were separate programs.

On a site review evaluation form (available from EIRI), the basic program received 75.3 of a possible 150 points, and the augmented program received 103.7 points of 150. It was clear that the ARC research was being implemented as intended and that there was a substantial difference in the nature of the services being provided in favor of the augmented condition. This fact was represented quantitatively, but qualitative differences in conditions further emphasized the distinction.

The ARC was doing a competent job. The inclusion of procedures used in the augmented condition clearly appeared to raise intervention near a level that would be considered "best practice." Overall, the site review team agreed that the augmented condition contained the procedures of choice based on available resources.

Costs of alternative interventions. During the 1987-88 academic year, cost data for each of the intervention programs were obtained using an "ingredients" approach. On Table 5.7, all cost estimates were adjusted for inflation to 1990 dollars. In addition, at the bottom of Table 5.7, the figures are discounted at 3%

and 5%. This approach includes resources such as direct services and administrative personnel, facilities, equipment, transportation, and materials and supplies. The estimated cost per child for each program is presented in Table 5.7. Data for the basic program includes all children enrolled in the ARC center-based program; including children in the basic and augmented programs, as well as children not enrolled in this study. The data on the basic program represents those financial resources provided by the ARC. The data for the augmented program represents the extra financial resources that were provided to those children in the three augmented classrooms, to implement the intervention described earlier.

The per-child cost for children in the basic program (see Table 5.7) appears high, but consideration of the facts that it is an all-day program which provides transportation and meals brings the cost figure into perspective. An additional 24% of the basic program per-child cost was needed to implement the augmented classroom program.

Ecobehavioral assessment. Another concern in regard to data collection is related to the specific effects the intervention had on teacher behavior and how differences in teacher behavior affect subject behavior. An ecobehavioral observation instrument was developed by the LSU Human Development Center staff to address these and related questions in the ARC study and was employed in the second year of intervention. Ecobehavioral measurement is based on the theory that interaction between the child and environment is continuous, reciprocal, and interdependent (Bijou & Baer, 1978). The ecobehavioral approach assesses program variables through systematic observation and measures moment-to-moment effects of the interactions between environment, teacher behavior, and student behavior (c.f., Carta & Greenwood, 1985). Data from the ecobehavioral observation allows for the examination of the types of behaviors exhibited by teachers in the two conditions and the effect of these on child behavior.

Table 5.7

Cost Per Child Per Year for ARC (1990 Dollars) Intervention Programs In ARC Paraprofessional Training Study

Resource	Basic (N = 82)	Augmented (N = 22)
1. UNDISCOUNTED		
Administration	$ 845	$ 1,200
Salaries	5,936	5,936
Consultants	531	2,188
Capital Assets *(includes depreciation of equipment and minor fixed assets)*	215	215
Occupancy	373	373
Transportation	921	952
Miscellaneous	531	709
SUBTOTAL	***$ 9,353***	***$11,574***
Contributed Resources		
Direct Services	0	16
Parent Time	234	232
Parent Transportation	428	115
SUBTOTAL	**662**	**363**
TOTAL	***$10,015***	***$11,937***
2. Discounted Costs (3%)		
Agency Resources	$10,220	$12,647
Total Resources	10,944	13,044
3. Discounted Costs (5%)		
Agency Resources	$10,827	$13,398
Total Resources	11,594	13,819

* Totals may not add up due to rounding errors.

The observation system developed for this study was based on the model of ecobehavioral assessment as described by Carta and Greenwood (1985) and was modeled after the Ecobehavioral System for Complex Assessment of the Preschool Environment [ESCAPE] (Carta et al., 1985). The instrument, the Ecobehavioral Assessment for Infant Programs [EAIP] (Atwater, Welge, & Rider, 1988) was designed specifically for intervention programs serving children below the age of three. The EAIP accommodates the behavioral competencies of very young children with disabilities and the characteristic features of very early intervention programs.

Observation for the EAIP were conducted in April and May 1988. Sixteen children were observed in augmented classes and 15 in basic classes. This represents all children who were receiving intervention from the program at that time except one from each group. These missing children were absent from school when observations were scheduled. Observations occurred in all six classrooms that were involved in the study. Each classroom was staffed by two paraprofessionals (teacher and aide).

The EAIP assesses three major features of center-based early intervention programs for infants and toddlers: the program ecology, the behavior of teachers and caregivers, and the behavior of child participants. Three specific ecological variables are assessed: the format of a child's activity, the materials used in the activity, and the child's physical location during the activity. For teachers, behavioral variables include teacher direction and the quality of teachers' responses to children. For children, behavioral variables include appropriate engagement in activities, communicative behavior, and competing (or inappropriate) behavior. A brief description of EAIP variables is presented in Table 5.8 (definitions of variables can be obtained from EIRI).

All variables were recorded on a time-sampling basis as they pertained to an individual child who was the target of the observation. Data were recorded during successive 15-second intervals, each consisting of 5 seconds for observation followed by 10 seconds for recording. An observation sample began with one interval for

Table 5.8

Outline of EAIP Variables and Categories Within Variables for ARC Paraprofessional Training Study

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ECOLOGICAL VARIABLES

A. ***Activity Format***

The overall format or structure of the activity in which the teacher has placed the target child.

- Snack
- Structured Play
- Personal Care
- Transition
- Manipulative Therapy
- Social Play
- Participant Routines
- Time-Out
- Individual Instruction

B. ***Materials***

Objects with which the target child is engaged or to which the child is attending.

- Large motor equipment
- Sensory-perceptual materials
- Non-toy materials
- No access to materials
- Pretend play toys
- Manipulatives
- Books, Pictures, and audio-visuals

C. ***Location***

The physical placement of the target child

- Held by adult
- Chair
- Crib/playpen
- Floor
- Table
- Adaptive Seat

TEACHER BEHAVIOR VARIABLES

A. ***Teacher Direction***

- Physical Direction
- Environment Arrangement
- Gestural Prompts/demonstration
- Monitoring
- Verbal Direction
- Disengaged
- Questions

B. ***Teacher Response***

The quality of teachers' responses to the target child.

- Reprimand/criticism
- Negative Feedback
- Praise
- Positive Feedback
- Ignoring

CHILD BEHAVIOR VARIABLES

A. ***Activity Engagement***

The child's interaction with and/or attention to the materials or people that are relevant to the activity in which the teacher has placed the child.

- Initiated engagement
- Active engagement
- Cooperation
- Attention

B. ***Communicative Behavior***

- Spontaneous (not prompted by the teacher)
- Word(s)
- Vocalization
- Gesture
- Body Orientation

C. ***Competing Behavior***

Behaviors that are inappropriate within the context of the child's activity and/or that could interfere with appropriate engagement and appropriate communication.

- Seizure
- Self-Stimulation
- Self-Injurious behavior
- Noncompliance
- Aggressive/Destructive Behavior
- Cry/Tantrum

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recording ecology variables, followed by four intervals for recording behavior variables. A child's behavior and teacher behavior toward that child were recorded concurrently. The sequence (1 ecology interval, 4 behavior intervals) was repeated until 10 minutes of data had been recorded. At the end of each 10-minute sample, a new target child was observed. An average of 12 10-minute samples, distributed across several days and different classroom activities, were obtained for every child (range = 9 to 15 samples per child). For each variable (e.g., activity format), one category (e.g., snack) was selected to represent each interval.

To assess the reliability of the observation system, two observers recorded data concurrently and independently for 19% of the samples. Agreement between observers, calculated as the percentage of intervals in which both observers selected the same category for a particular variable, averaged 85% across variables, with a range of 74% to 96%.

Comparative data from the ecobehavioral analysis for classrooms from the augmented and basic conditions are provided in Table 5.9. The percentages represent the average portion of total observation time that children in each condition spent in specific ecological contexts, received direction and response from teachers, and exhibited particular appropriate and inappropriate behaviors. To evaluate differences between conditions, two-tailed t-tests (df = 29) were performed on individual percentage scores.

As illustrated in Table 5.9, teachers who had received the augmented intervention services provided more structured and varied classroom experiences than did teachers who had received only in-service instruction. When compared to those in basic classrooms, children in augmented classrooms more often participated in snack and participant routines (activities involving joint participation and turn-taking with other children). In basic classrooms, children spent over half their time in no identifiable activity. The comparable proportion of times no identifiable activity occurred was significantly lower in augmented classrooms.

Table 5.9

Percentage of Time in Categories Observed by the Ecobehavioral Instrument for the ARC Paraprofessional Training Study

	Basic (n = 15)		Augmented (n = 16)				
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	t	ES^	P Value
ECOLOGICAL CONTEXTS							
Activity Format							
Snack	11.07	9.05	26.43	13.66	3.67	1.70	.001
Personal Care	4.16	4.09	3.36	3.15	.61	-.20	.545
Manipulative therapy	1.01	2.25	2.05	3.22	1.03	.46	.310
Participant routines	7.78	7.80	25.77	7.86	6.39	2.31	.000
Individual instruction	4.31	6.20	3.31	5.24	.48	-.16	.633
Structured play	8.62	5.70	13.33	10.28	1.59	.83	.125
Transition	6.71	5.39	5.09	4.47	.91	-.30	.370
Social play	.97	2.34	.17	.70	1.27	-.34	.221
Time out	1.31	2.49	.72	2.18	.70	-.24	.488
No specified format	54.06	10.51	19.76	16.48	6.86	-3.26	.000
Materials							
Large motor equipment	8.82	8.43	8.83	4.95	.00	.001	.998
Non-toy materials	17.88	6.93	24.87	14.41	1.74	1.01	.096
Pretend play toys	9.57	8.10	6.68	5.92	1.14	-.36	.265
Manipulatives	16.70	8.75	15.90	9.95	.23	-.09	.816
Books and audio-visual materials	5.56	5.51	6.98	8.00	.57	.26	.572
Sensory-perceptual toys	.21	.58	3.20	4.94	2.41	5.16	.029
Other materials	1.35	1.86	.39	1.07	1.75	-.52	.094
No access to materials	9.62	13.61	19.82	20.78	1.60	.75	.119
No contact with materials	30.28	8.99	13.31	9.42	5.12	-1.89	.000
Location							
Held by a teacher	.75	1.59	.58	.93	.38	-.11	.711
Crib or playpen	.49	1.88	.00	.00			
Seated at a table	29.15	14.07	31.87	16.02	.50	.19	.620
Adaptive seating	6.72	21.57	14.54	24.44	.94	.36	.354
Free-standing chair	6.47	7.02	19.67	13.41	3.46	1.88	.002
On floor	21.75	10.48	22.62	20.17	.15	.08	.881
None of the above	34.67	20.42	10.72	9.76	4.12	-1.17	.001
TEACHER BEHAVIOR TOWARD CHILDREN							
Direction							
Physical direction	5.38	5.19	7.54	4.83	1.20	.42	.240
Gestural prompts and demonstration	1.71	2.55	3.56	2.91	1.88	.73	.071
Verbal direction	6.65	4.68	6.04	3.56	.41	-.13	.684
Questions	1.85	1.39	1.59	1.22	.54	-.19	.593
Environmental arrangement	.02	.06	.12	.17	2.31	1.67	.032
Visual monitoring	30.97	14.50	33.17	13.31	.44	.15	.664
Disengaged (not attending to classroom)	.59	.69	.00	.00	----	-----	----
Response							
Reprimand or criticism	.48	.85	.19	.49	1.18	-.34	.251
Negative task feedback	.39	.29	.17	.27	2.22	-.76	.034
Praise	.28	.44	.46	.43	1.20	.41	.241
Positive task feedback	.14	.28	.16	.20	.20	.07	.846
Ignoring child initiation	.66	1.18	.19	.48	1.45	-.40	.163

(continued)

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Table 5.9 (continued)

Percentage of Time in Categories Observed by the Ecobehavioral Instrument for the ARC Paraprofessional Training Study

	Basic (n = 15)		Augmented (n = 16)				
	$\bar{x}$	(SD)	$\bar{x}$	(SD)	t	ES^	p Value
CHILD BEHAVIOR							
Activity Engagement							
Engagement	35.05	14.77	29.60	15.93	.99	-.37	.332
Cooperation with physical direction	5.18	5.12	7.23	4.71	1.16	.40	.255
Visual attention to activity	28.56	10.39	39.33	13.59	2.47	1.04	.020
Communicative Behavior							
Verbal	6.36	9.20	1.70	3.13	1.86	-.51	.080
Nonverbal (vocalization, gesture, and change in body orientation)	2.94	2.52	3.29	2.50	.38	.14	.705
Competing Behavior							
Seizure	.02	.08	.00	.00	----	----	----
Self-injurious behavior	.00	.00	.00	.00	----	----	----
Aggressive or destructive behavior	.86	1.25	.04	.11	2.54	-.66	.023
Crying	2.67	3.32	1.98	4.70	.47	-.21	.641
Self-stimulation	.61	2.27	.31	.93	.46	-.13	.647
Noncompliance	.54	.81	.60	1.10	.17	.07	.868

$$ES = \frac{\text{Augmented } \bar{x} - \text{Basic } \bar{x}}{\text{Basic SD}}$$

The sign of the ES is not intended to indicate that more or less of the category is better. It only indicates the direction of the result. A plus sign indicates the category occurred more for the augmented group; a minus sign indicated a higher occurrence in the basic group.

Results of the ecobehavioral observations indicate that the augmented intervention did have an effect on teacher behavior as it relates to the structure of their daily activities, but not as it related to their behavior toward children. Unfortunately, these activity changes were not accompanied by significantly higher, at the $p < .001$ level, rates of teacher prompting (categories of physical direction and gestural prompts and demonstration), or positive teacher responses (categories of praise and positive task feedback). These teacher behaviors are expected to occur more frequently when using incidental teaching techniques (Haring & Innocenti, 1988). In addition, they were not accompanied by more positive teacher direction such as physical and verbal directives. Gestural prompts and demonstration occurred more frequently--2½% more of the time spent--the p-value at .07 was not significant.

An interesting aspect of the ecobehavioral data is the finding that active engagement was not significantly different between groups. Active engagement is considered the critical child behavior to increase to maximize child learning (Carta et al., 1988). The classroom contexts most frequently used by the teachers in augmented classrooms appears to have primarily effected child visual attending behaviors. This result may require the re-examination of some assumptions regarding the use of incidental teaching for toddler-aged children and/or the way in which others are trained in its use.

Data Collection

A variety of measures of child and family functioning were used to examine whether the interventions resulted in differences between the groups.

Recruitment, training, and monitoring of diagnosticians. Local test examiners were recruited from staff at the Louisiana State University (LSU) Human Development Center who were not involved with the ARC research. Examiners were "blind" to individual subject's group assignment. Examiners were certified as competent BDI administrators through procedures developed by EIRI. These procedures required a minimum of three practice administrations prior to a test session, one of which was observed and rated by the LSU site liaison or EIRI assessment coordinator. In addition, examiners sent one videotaped BDI session to the EIRI assessment coordinator for review prior to their first test session, and one each year they served as examiners.

These training procedures occurred in addition to monitoring in the form of a 10% shadow score of all test administrations by the LSU site coordinator for all 4 tests administered. All test protocols were then rechecked by EIRI clerks prior to entry on computer, and data on examiners was kept. No problems in test administration or scoring have been revealed by this process with the ARC examiners. The reliability averages for pretest = .82, Posttest #1 = .96, Posttest #2 = .83, and Posttest #3 = .93.

Examiners also handed surveys and measures to parents to complete during test sessions. These measures were described to parents and assistance was given in completing the surveys where needed. If unusual circumstances occurred (e.g., a parent unable to read), a second examiner was brought in to assist the parent. Parents were asked not to discuss their child's classroom placement.

The BDI examiners also administered the other posttest measures. These measures were administered at the intervention sites but not in the classrooms. At Posttest #1 (1988), an exception was made, and the Early Intervention Developmental Profile (EIDP) was administered in the classroom. Although examiners were not told which condition classrooms were in, differences may have been evident. The EIDP was the last measure administered. Ten percent of these measures were scored by another examiner (shadow scored), and no problems were encountered. Examiners were also trained in the administration of these measures prior to their use. The examiners who administered Posttests #2 and #3 were different from those who examined children at Pretest and Posttest #1, thus decreasing the probability that the examiners know subject's group assignment.

Posttest #1 examiners were recruited from the LSU Human Development Center while Posttests #2 and #3 were given by Graduate Students at the University of New Orleans. All examiners were blind to the group assignment of the subjects who were tested.

Battelle Developmental Inventory. All children were administered the Battelle Developmental Inventory (BDI). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. As a norm referenced measure appropriate for children from birth to age 8, the BDI served as the primary measure of child development. Test characteristics of the BDI allow valid assessment in a number of developmental domains, and the age range it spans allow for its use in longitudinal research. The BDI was selected for use in the EIRI research based upon the results of an expert panel convened to help determine appropriate measures and is used at all EIRI research sites.

Measures of family functioning. Parents of children in the study completed the following scales of family functioning: Parenting Stress Index (PSI), Family Resource Scale (FRS), and the Family Adaptability and Cohesion Evaluation Scales (FACES). These measures assess, respectively: parent stress, family resources, and functioning of the family in respect to an "ideal" family. Family functioning has been an overlooked area of early intervention research (Casto & Mastropieri, 1986); thus, a variety of family functioning instruments were used to detail changes that may occur given different types of early intervention services. These measures also allowed the determination of services that were more beneficial to certain types of families. These family measures and the BDI (core measures) are completed at each test session.

Early Intervention Developmental Profile (EIDP). The EIDP is based on a listing of developmental skills and provides a more comprehensive breakdown of skills by age level than is available through the BDI. With the severity of of children's disabilities in this study, the EIDP may be more sensitive to child gains than the BDI and, thus, a more accurate indicator of child change.

Interactive Communication Inventory (ICI). Communication skills were a primary focus of the augmented condition, and the majority of children enrolled in the ARC exhibited language delays. The ICI assesses language development in 7 areas (e.g., morphology, phonological, etc.) and, like the EIDP, will allow a more sensitive assessment of child language skills than provided by the BDI.

Pretest. Subjects involved in the study during the first year were pretested in November and December 1986. Subjects newly enrolled in the study for the second year were pretested in October and November 1987. Testing occurred at each child's respective school. The BDI was administered, and parents, mostly mothers, completed the family measures. These included those measures described earlier, as well as the Family Support Scale (FSS) and Family Inventory of Life Events (FILE). Parents also provided demographic information. The FSS and FILE were measures in the EIRI core battery for assessment of families. Concerns were raised by site staff regarding the number of family measures with this subject population in light of the nature of the study and intervention services, and some of the family measures were dropped in subsequent years. Families were paid $20 for participating in the data collection activities.

First posttesting. Posttest #1 occurred at the end of the intervention period for all children in the study. For some of the subjects this occurred in August 1987; for others, it took place in May of 1988 (see Figure 5.1). The posttest battery consisted of the core battery of tests and surveys as well as complementary and treatment verification measures described earlier. Procedures described earlier were followed for posttest assessment. Parents were paid $40 at Posttest #1.

Second posttesting. In 1988, when 1987 "graduated" subjects were to receive their second posttest, budget negotiations were occurring between the LSU Human Development Center (HDC) and EIRI. The result of these negotiations was that the HDC would not be involved in post-intervention follow-up activities. As this negotiation process was not resolved until late Fall 1988, combined with the preparations needed to train new examiners and locate subjects, it was decided that all subjects would receive post-intervention follow-up testing during Summer 1989.

David Sexton, professor and chair of the Special Education Department, University of New Orleans (UNO), served as local site coordinator for follow-up activities during the 2nd and 3rd Posttests. Graduate students and faculty at UNO received EIRI Battelle Training and were certified as examiners. Posttest #2 testing began in May 1989 and was completed in September 1989 for all subjects who received intervention. Analysis on these data is included in this report.

Third posttesting. Posttest #3 was completed for 55 subjects in September, 1990. Assessments were coordinated and given by the same staff at the University of New Orleans who conducted follow-up for Posttest #2. Parents were paid $55 for completing the Posttest #2 battery, which included the BDI, FACES, PSI, FRS, and demographic and additional services information.

Results and Discussion

This study examined the effects of two different procedures for training paraprofessionals on child and family functioning outcome measures. One training procedure, the basic (control) condition, is low intensive involving only minimal contact between professionals and paraprofessionals. The other procedure, the augmented (experimental) condition, is high intensive and makes use of a collaborative consulting model that involves frequent and sustained training contacts between the professional and paraprofessional.

The following section will examine group comparability on pretest measures and present the effects of intervention on child and family functioning for all subjects after intervention for three posttests. A subgroup analysis conducted with Posttest #1 data, based on severity of developmental delay, for children receiving one year of intervention will also be presented.

Comparability of Groups on Pretest Measures

Comparability of groups on demographic characteristics for each group of posttest subjects was presented in Tables 5.1 - 5.3. Group differences on pretest measures for Posttests #1-#3 are presented in Tables 5.10 - 5.12.

Table 5.10

Comparability of Posttest #1 Groups on Pretest Measures for ARC Paraprofessional Training Study

	Basic Intervention			Augmented Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES^
• Age in months at pretest	23.7	(6.5)	32	23.0	(7.2)	32	.70	-.11
• Battelle Developmental Inventory (BDI)*								
DQs for:								
Personal Social	41.3	(28.0)	32	46.9	(22.6)	32	.56	.20
Adaptive Behavior	50.6	(28.9)	32	49.7	(23.0)	32	.81	-.03
Motor	40.3	(27.4)	32	41.9	(21.4)	32	.74	.06
Communication	50.4	(28.8)	32	44.1	(22.9)	32	.19	-.22
Cognitive	44.4	(29.5)	32	45.7	(24.6)	32	.74	.04
TOTAL	45.9	(27.3)	32	47.9	(20.9)	32	.94	.07
• Parenting Stress Index (PSI)**								
Child Related (range 50 to 250)	112.8	(20.9)	32	126.8	(15.0)	32	.003	-.67
Other Related (range 54 to 270)	123.3	(24.0)	32	130.4	(25.7)	32	.26	-.30
TOTAL (range 101 to 504)	236.1	(40.3)	32	257.2	(32.4)	32	.02	-.52
• Family Adaptation and Cohesion+ Evaluation Scales (FACES)								
Adaptation (range 0 to 30)	5.4	(3.8)	32	5.2	(4.0)	32	.81	.05
Cohesion (range 0 to 26)	6.2	(5.9)	32	5.0	(4.1)	32	.32	.20
TOTAL (range 0 to 40)	9.1	(5.9)	32	8.0	(4.5)	32	.41	.19
Discrepancy (range 0 to 80)	13.5	(12.3)	32	12.4	(12.3)	31	.71	.09
• Family Resource Scale (FRS)& (range 30 to 150)	108.9	(15.8)	32	110.8	(20.7)	31	.67	.12

^ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, FACES, AND FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw score to a ratio Developmental Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

** Analyses for the PSI are based on raw scores. Lower scores are considered better.

+ Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

& Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

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Table 5.11

Comparability of Posttest #2 Groups on Pretest Measures for ARC Paraprofessional Training Study

	Basic Intervention			Augmented Intervention				
Variable	X̄	(SD)	n	X̄	(SD)	n	p Value	ES^
• Age in months at pretest	23.2	(7.1)	25	22.8	(7.6)	29	.84	-.06
• Battelle Developmental Inventory (BDI)*								
DQs for:								
Personal Social	43.0	(29.0)	25	48.0	(23.0)	29	.49	.17
Adaptive Behavior	51.0	(29.0)	25	49.0	(24.0)	29	.81	-.07
Motor	41.0	(28.0)	25	40.0	(21.0)	29	.91	-.04
Communication	51.0	(29.0)	25	43.0	(23.0)	29	.29	-.28
Cognitive	46.0	(30.0)	25	45.0	(25.0)	29	.94	-.03
TOTAL	47.0	(27.0)	25	47.0	(22.0)	29	.90	.00
• Parenting Stress Index (PSI)**								
Child Related (range 50 to 250)	111.0	(22.5)	25	126.2	(15.1)	29	.01	-.68
Other Related (range 54 to 270)	119.7	(23.7)	25	130.8	(26.4)	29	.11	-.47
TOTAL (range 101 to 504)	230.8	(41.3)	25	257.0	(33.6)	29	.01	-.63
• Family Adaptation and Cohesion+ Evaluation Scales (FACES)								
Adaptation (range 0 to 30)	5.6	(3.9)	25	5.0	(3.9)	29	.57	.15
Cohesion (range 0 to 26)	6.1	(5.9)	25	5.1	(4.1)	29	.44	.17
TOTAL (range 0 to 40)	9.0	(6.1)	25	7.8	(4.6)	29	.41	.20
• Family Resource Scale (FRS)& (range 30 to 150)	108.6	(17.2)	25	111.6	(19.5)	28	.56	.17
• Family Inventory of** Life Events (FILE) (range 0 to 71)	9.1	(6.3)	25	10.5	(6.4)	28	.42	-.22
• Family Support Scale (FSS)@ Total Score by mother (range 0 to 4)	2.0	(1.0)	25	2.0	(1.0)	29	.95	.00

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^ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI,FACES, AND FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw score to a ratio Developmental Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

** Analyses for the PSI and FILE are based on raw scores. Lower scores are considered better.

+ Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

& Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

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Table 5.12

Comparability of Posttest #3 Groups on Pretest Measures for ARC Paraprofessional Training Study

	Basic Intervention			Augmented Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	p Value	ES[^]
• Age in months at pretest	23.2	(6.8)	27	23.1	(7.5)	28	.97	-.01
• Battelle Developmental Inventory (BDI)[*]								
DQs for:								
Personal Social	36.1	(20.9)	27	37.8	(14.0)	28	.73	.08
Adaptive Behavior	30.4	(14.2)	27	29.0	(11.5)	28	.70	-.10
Motor	37.7	(24.6)	27	37.6	(19.6)	28	.99	-.00
Communication	22.1	(10.0)	27	18.6	(7.8)	28	.16	-.35
Cognitive	16.0	(8.6)	27	16.4	(6.4)	28	.85	.05
TOTAL	142.2	(74.2)	27	139.4	(52.2)	28	.87	-.04
• Parenting Stress Index (PSI)[**]								
Child Related (range 50 to 250)	112.6	(21.9)	27	127.6	(15.2)	28	.004	-.68
Other Related (range 54 to 270)	122.0	(24.8)	27	129.8	(26.8)	28	.27	-.31
TOTAL (range 101 to 504)	234.5	(42.0)	27	257.4	(33.2)	28	.03	-.55
• Family Adaptation and Cohesion[+] Evaluation Scales (FACES)								
Adaptation (range 0 to 30)	5.6	(3.7)	27	5.3	(3.8)	28	.72	.08
Cohesion (range 0 to 26)	6.4	(6.1)	27	5.2	(4.1)	28	.38	.20
TOTAL (range 0 to 40)	9.3	(6.1)	27	8.1	(4.4)	28	.41	.20
• Family Resource Scale (FRS)[&] (range 30 to 150)	109.0	(17.0)	27	113.3	(20.0)	27	.40	.25
• Family Inventory of[**] Life Events (FILE) (range 0 to 71)	9.6	(6.5)	27	10.1	(6.5)	27	.77	-.08
• Family Support Scale (FSS)(@) Total Score by mother (range 0 to 4)	30.3	(12.4)	27	30.8	(13.2)	28	.88	.04

[^] Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size). For the PSI, FACES, AND FILE, the numerator for the ES is calculated as: Less Intensive minus More Intensive as lower scores are preferred.

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw score to a ratio Developmental Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[**] Analyses for the PSI and FILE are based on raw scores. Lower scores are considered better.

[+] Scores for each of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

[@] Analyses for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

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Posttest #1. For Posttest #1, subjects were comparable in all BDI domains, on the BDI total score, and for chronological age at pretest. On measures of parent and family functioning, group differences were found only on PSI measures of child related and total stress. Parents of subjects in the augmented group report greater amounts of stress than parents of basic condition subjects. Families of subjects in both groups appear comparable in relation to sources of support, occurrence of major life events, and perception of the family in relation to the "ideal."

In view of the fact that comparisons were made on 16 different variables, it would not be surprising to find statistically significant differences on two of them, even if the groups are completely comparable. The average effect size across all pretest measures was -.06, suggesting the groups were comparable. Assuming that families of children in the augmented group are showing greater levels of stress (effect size of -.29 on the PSI Total and FILE), this effect was balanced by greater levels of support and resources, and by functioning closer to an ideal family (effect size of .14 on FRS, FSS, FACES Total). Overall, it appears that the groups were comparable on pretest measures.

Posttest #2. Group comparability on pretest measures for subjects compared at this posttest is presented in Table 5.11. These results are similar to the Posttest #1 comparability results. No differences exist between groups on the BDI. The only family measure where a group difference is indicated is on the PSI. Parents of children in the augmented group reported more stress at pretest. Other family measures tended to favor the augmented group, though not significantly so. The average effect size for the family measures of -.10 suggest overall equity of family functioning. The average effect sizes for all pretest measures was -.07. This suggests groups were comparable at pretest.

Posttest #3. Pretest differences on family and child functioning measures for the subjects included in Posttest #3 are presented in Table 5.12. Using a p-value significance of ≤ .05, differences between the groups were found on the PSI child-related score and PSI Total. For these measures of family stress, the families in the augmented group continued to report significantly more stress. The average effect size across all 16 different pretest family and child functioning measures is -.08. This suggests, as in the previous two posttests, that the groups were comparable on the measures prior to intervention.

Effects of Alternative Forms of Intervention

The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates for each of the three posttests depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical p value for assuming statistical significance was set at 0.05.

Child functioning. Table 5.13 presents the effects of alternate forms of intervention on Posttest #1 measures of child functioning from the BDI, EIDP, and ICI. This includes 13 children who received two years of intervention and 51 who participated in the program for one year. Effects for measures other than child functioning included on Table 5.13 were analyzed using an analysis of variance procedure. The results of the analyses reported in Table 5.13 demonstrate no significant effects of intervention in favor of the augmented condition as assessed by the BDI, EIDP, or ICI. On the BDI Personal/Social and cognitive scores, the children in the basic intervention scored significantly higher than those in the augmented group with p-values of .09 and .04, respectively. The average effect size across the total from all three measures was -.10. These results provide some evidence that the basic group performed better although the BDI scores are not confirmed by the other child measures.

Posttest #2 results are similar to Posttest #1. No differences favor the augmented group on the BDI. Only one domain shows significant differences between the groups. The Battelle measure of personal/social development favors the basic group with a p-value = .05. The average ES across all domains equals -.14.

The BDI results from Posttest #3 suggest that children in the augmented group did not perform better than the basic group on either the BDI domains or the total score. The effect sizes are all negative, and the average equals -23.5, which suggests that the scores on the Battelle were consistently lower in the augmented group relative to the basic group. The significance of the BDI measure of personal/social skills continued for the third year with a p-value of .02. The basic group also performed better than the augmented group on cognitive and total scores of the Battelle at the third posttest, as indicated in Table 5.13.

Table 5.13

Posttest Measures of Child Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

		One Year of Intervention										
		Basic Intervention				Augmented Intervention						
Variable	Covariates'	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES^
POSTTEST #1												
Average length of intervention in months	---	8.7	(3.6)		32	8.7	(3.4)		32	.00	.00	1.00
Age at posttest (months)	---	32.9	(5.6)		32	32.3	(6.3)		32	.18	-.11	.68
Battelle Developmental* Inventory												
Personal/Social	1	59.3	(29.3)	60.6	32	54.0	(22.7)	52.6	32	2.92	.09	-.27
Adaptive Behavior	2	42.4	(18.1)	42.0	32	39.8	(13.0)	40.2	32	.73	.40	-.10
Motor	3	53.2	(30.8)	54.2	32	51.5	(23.8)	50.5	32	1.27	.26	-.12
Communication	4	28.4	(12.4)	26.8	32	24.9	(10.5)	26.5	32	.05	.82	-.02
Cognitive	5	20.2	(11.1)	20.6	32	18.4	(6.7)	18.1	32	4.36	.04	-.23
TOTAL	6	203.5	(96.7)	204.3	32	188.6	(68.2)	187.9	32	2.35	.13	-.17
Early Intervention Dev.* Profile (EIDP)												
Gross Motor	6	45.1	(24.9)	45.2	32	47.6	(21.4)	47.4	32	.34	.56	-.09
Fine Motor	11,6	27.0	(15.5)	27.3	32	25.0	(11.3)	24.7	32	2.29	.14	-.17
Feeding	6	21.2	(8.2)	21.2	32	22.0	(7.3)	21.9	32	.35	.55	.09
Hygiene	6,7	5.0	(3.7)	5.1	32	5.2	(3.3)	5.1	31	.00	.98	.00
Toileting	6	2.6	(2.8)	2.6	32	2.1	(2.1)	2.1	32	1.25	.27	-.18
Cognitive	11,6	24.3	(13.9)	24.5	32	23.2	(9.8)	22.9	32	1.23	.27	-.12
Self-Care	11,6	28.8	(13.6)	29.1	32	29.1	(11.2)	28.8	32	.02	.88	-.02
TOTAL	11,6	125.4	(65.2)	126.7	32	124.9	(49.6)	123.6	32	.22	.64	-.05
ICI Total*	6	35.1	(23.0)	34.8	29	30.8	(15.4)	31.0	31	1.50	.23	-.17
POSTTEST #2												
Age in months at Posttest		52.0	(9.5)		24	50.8	(9.4)		29		.63	
Battelle Developmental* Inventory												
Personal/Social	1,25	80.5	(43.6)	82.0	24	70.2	(29.2)	68.7	29	4.00	.05	-.31
Adaptive Behavior	2	52.0	(22.7)	51.5	24	47.8	(17.0)	48.3	29	.80	.37	-.14
Motor	3	62.9	(37.0)	63.6	24	61.6	(26.1)	60.9	29	.42	.52	-.07
Communication	4	35.5	(17.0)	33.1	24	32.1	(14.1)	34.5	29	.29	.60	.08
Cognitive	5,8	29.8	(16.2)	29.4	24	25.4	(9.8)	25.8	29	2.07	.16	-.22
TOTAL	6	260.7	(128.3)	260.7	24	237.2	(84.6)	237.2	29	2.41	.13	-.18
POSTTEST #3												
Age in months at Posttest		61.9	(8.8)		27	61.2	(9.6)		28	1.2	.76	-.09
Battelle Developmental* Inventory												
Personal/Social	1	99.7	(44.5)	101.1	27	85.0	(34.9)	83.6	28	5.97	.02	-.39
Adaptive Behavior	2,8,7	60.5	(25.7)	58.5	27	54.5	(16.2)	56.5	27	.29	.59	-.08
Motor	3,8	78.6	(42.0)	77.0	27	69.5	(30.5)	71.1	28	1.47	.23	-.14
Communication	4	43.7	(20.7)	40.8	27	36.2	(17.1)	39.1	28	.28	.60	-.08
Cognitive	5	36.4	(20.3)	36.8	27	28.3	(12.0)	28.0	28	9.50	.00	-.43
TOTAL	6,8	318.9	(143.1)	312.6	27	271.8	(99.2)	271.8	28	4.15	.05	-.29

* Statistical analysis for BDI, EIDP, and ICI scores were conducted using raw scores for each of the scales.

^ Effect Size (ES) is defined here as the difference between the groups (Augmented minus Basic) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size).

' Covariates: 1 = BDI personal/social; 2 = BDI adaptive; 3 = BDI motor, 4 = BDI communication; 5 = BDI cognitive; 6 = BDI Total; 7 - FILE Total; 8 = PSI child; 9 = both parents living at home (intact); 10 = FACES discrepancy; 11 = PSI child; 12 = PSI other; 13 = PSI Total; 14 = FACES total; 15 = FACES cohesion; 16 = FACES adaptation; 17 = FRS general resources.

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Family Functioning. Table 5.14 presents effects of alternative intervention on Posttest #1 measures of family functioning. These results suggest that alternate forms of intervention did not have a significant effect on parent stress, family resources, or family adaptation and cohesion. The FRS, with a p-value = .07, implies significantly higher resources in the augmented group families than the basic group families.

No differences between groups were found on any of the family measures at Posttest #2. This result is not unexpected based on the group comparability at pretest and the nature of the intervention.

Parental stress related to the child is clearly higher for the families who were in the augmented program than for those who received services in the basic program at Posttest #3. The p-value for the child related PSI has a significant value in favor of the families in the basic group, .03 and an effect size equal to -.60. None of the other family measures show significant differences between the groups.

Subgroup Analysis. The argument could be raised that one year of intervention was not sufficient for group differences to emerge. Although this argument has limited functional utility, as the majority of ARC children only receive one year of intervention, it can be explored with the 13 children in this study who received two years of intervention.

Tests were conducted to assess the comparability of groups for these 13 children on the demographic measures and pretest measures. No differences were found on any of the demographic characteristics. The combined results on those subjects who received two years of intervention does not provide support for the augmented condition. This is based on analysis of the BDI, EIDP and ICI child functioning measures and PSI, FRS, and FACES family measures.

Posttest #1 Severity Analysis. Many subjects in this study exhibited more involved disabilities, and the developmental quotient of half the subjects was below 50. These factors raised some concerns regarding the possibility of differential effects

Table 5.14

Posttest Measures of Family Functioning for Alternative Intervention Groups for ARC Paraprofessional Training Study

		One Year of Intervention										
		Basic Intervention				Augmented Intervention						
Variable	Covariates[+]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[^]
POSTTEST #1												
Parent Stress Index (PSI)[♦]												
Child Related	14	111.0	(22.2)	115.8	32	122.6	(17.6)	117.8	32	.24	.63	-.09
Other Related	16	115.0	(23.7)	117.3	32	126.3	(26.3)	124.0	32	1.93	.17	-.28
TOTAL	15	225.9	(42.5)	233.2	32	248.9	(38.3)	241.6	32	1.02	.32	-.20
Family Resource Scale[♦] (FRS) TOTAL	7,16	111.9	(22.3)	111.2	31	119.1	21.3)	119.8	31	3.42	.07	.39
Family Adaptation and Cohesion Evaluation Scales (FACES)[*]												
Cohesion	8	6.0	(7.4)	5.9	31	4.6	(3.1)	4.6	31	.75	.39	.18
Adaptation	9	5.9	(4.8)	5.9	31	5.6	(3.6)	5.6	31	.11	.74	.06
TOTAL	8	9.3	(7.9)	9.1	31	7.7	(3.7)	7.8	31	.72	.40	.16
Discrepancy	10	9.5	(10.3)	9.4	30	9.7	(8.7)	9.8	31	.03	.86	.04
POSTTEST #2												
Parent Stress Index (PSI)[♦]												
Child Related	8	112.2	(14.8)	115.6	25	125.8	(24.3)	122.4	29	1.80	.23	-.46
Other Related	12	114.8	(22.2)	117.8	25	131.3	(30.1)	128.2	29	2.59	.11	-.47
TOTAL	13	227.0	(31.0)	234.2	25	257.1	(51.1)	249.9	29	2.02	.16	-.51
Family Resource Scale[♦] (FRS) TOTAL	24	114.1	(17.4)	114.9	25	111.9	(20.5)	111.0	28	.73	.40	-.22
Family Adaptation and Cohesion Evaluation Scales (FACES)[*]												
Cohesion	15,17	5.0	(3.6)	4.7	25	4.4	(3.5)	4.7	28	.00	.99	.00
Adaptation	7	5.8	(3.7)	5.6	25	4.7	(2.5)	4.8	28	.99	.32	.22
TOTAL	14,21	8.3	(4.1)	8.0	25	6.8	(3.3)	7.1	29	.97	.33	.22
Discrepancy	10	9.1	(9.9)	9.4	24	9.0	(9.0)	8.7	29	.12	.73	.07
POSTTEST #3												
Parent Stress Index (PSI)[♦]												
Child Related	11,8	106.7	(18.2)	111.0	27	125.7	(21.5)	121.4	28	4.40	.04	-.57
Other Related	18,12	120.2	(25.3)	123.1	27	130.5	(33.2)	127.6	28	.54	.47	-.18
TOTAL	19,13,20	226.9	(39.9)	235.6	27	256.2	(51.7)	247.5	28	1.32	.26	-.30
Family Resource Scale[♦] (FRS) TOTAL	22,23	116.4	(16.5)	118.8	16	112.7	(27.7)	110.4	15	1.37	.25	-.51
Family Adaptation and Cohesion Evaluation Scales (FACES)[*]												
Cohesion	15,21	4.2	(3.7)	4.1	27	5.1	(4.0)	5.2	28	1.23	.27	-.30
Adaptation	16	4.5	(3.8)	4.4	27	4.4	(3.3)	4.5	28	.00	.96	-.03
TOTAL	14	7.1	(3.8)	7.0	27	7.4	(4.2)	7.6	28	.31	.58	-.16

[*] Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the :ideal" where a score of "0" is considered best.

[^] Effect Size (ES) is defined here as the difference between the groups (Basic minus Augmented) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Less Intensive Group (see Glass, 1976; Tallmadge, 1977 and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[♦] Statistical analyses and Effect Sizes (ES) for the PSI and FRS were based on raw scores. For the PSI, low scores are more desireable.

[+] Covariates: 1 = BDI personal/social; 2 = BDI adaptive; 3 = BDI motor, 4 = BDI communication; 5 = BDI cognitive; 6 = BDI Total; 7 - FILE Total; 8 = PSI child; 9 = both parents living at home (intact); 10 = FACES discrepancy; 11 = PSI3 child; 12 = PSI other; 13 = PSI Total; 14 = FACES total; 15 = FACES cohesion; 16 = FACES adaptation; 17 = FRS general resources; 18 = PSI 3 Other; 19 = PSI3 Total; 20 - FSS Mother Total; 21 = Mother Education; 22 = Father living with child; 23 = Hours worked per week (father); 24 = FRS Total; 25 = FSS Mother source of support.

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of intervention based on the degree of delay exhibited by a child. These concerns were reaffirmed by a finding from the ecobehavioral analysis where less delayed subjects exhibited more active engagement and communicative behaviors. To examine this issue, subjects in each group were placed into a severe or mild disability category based on their pretest scores. A developmental quotient (DQ) was obtained by dividing the BDI Posttest #1 total age equivalent by chronological age at Posttest #1 and then multiplying this sum by 100. Subjects with a DQ less than 50 were placed in the severe category, the others in the mild category. A group by severity of disability (2 x 2) analysis of variance was then conducted. The results of this analysis for child functioning measures show that interactions between group assignment and severity of disability are not supported by the data. Using a cutoff of $p \leq .10$, none of the BDI or EIDP domains has a significant interaction effect.

Conclusions

This study investigated the effects of two different types of training interventions for paraprofessionals who worked with toddler-aged children with disabilities. The investigation examined the effect on the paraprofessionals, the children they taught, and the families of these children. Training interventions compared were an inservice-based, minimal contact with professionals model--the basic condition (a commonly-used training arrangement)--versus a consultative model that used frequent and regular contact with professionals focused on teaching "best-practice" intervention strategies (the curriculum sequencing model)--the augmented condition. The results of this investigation present an interesting mix that has implications for many areas of early intervention for toddler-aged children with disabilities.

A logical place to begin is with the question, "did the intervention effect the target group at which it was aimed; i.e., the teachers?" All of the treatment verification data suggest that the augmented classroom intervention was being implemented as intended. Both of the site reviews suggest that the interventions in the two classrooms were different, qualitatively and quantitatively favoring the augmented classrooms. The ESCAPE data and analysis suggest that the paraprofessional training in the augmented classrooms probably affected the classroom ecology by increasing the percentage of time children spent in structured formats. All of the variables for which there were differences in teacher behavior toward children favored the augmented teacher behaviors. Significant differences include less negative task feedback, more environmental arrangement, and more gestural prompts and demonstrations in the augmented teacher responses to children. The data suggests that the augmented intervention was measurably different from the basic intervention and was providing an intervention that was closer to that which is considered "best practice" when compared with the basic condition. However, one area not affected by the augmented intervention was child-engaged behavior. The area may be an important one in respect to positive child developmental outcomes (Carta et al., 1988; Greenwood, Delquadri, & Hall, 1984; Innocenti, 1990).

The second question concerns the effect of the interventions on the children in the two intervention groups. The answer to this question comes from several different analytical perspectives. First, it was shown that the child development scores were not significantly different at pretest. An analysis of subjects by group assignment at Posttest #1 showed personal-social and cognitive scores that shifted in favor of the basic group with effect sizes of -.27 and -.23, respectively. Nor did the severity analysis show any significant interactions between intervention and severity of disability. Posttest #2 results show personal-social scores still higher for the basic subjects when compared with the augmented group, with an effect size = -.31 in favor of the basic subjects, and no differences that favor the augmented children. Posttest #3 analysis by group showed the largest differences to date. The analysis of effects by group results in effect sizes for 13 Posttest #3 measures of family and child functioning which favor the basic group of subjects. Significant child functioning differences were found on the personal-social, cognitive, and total BDI scores. Clearly, the results of the analysis favor the basic group.

A third question concerns the effect of the intervention on the families of children involved in the research. The intervention itself directly affected all families equally: length of daily and yearly intervention is the same in both groups, all children are bussed to classroom sites, and all parents are expected to interact with program staff at the same level (one IHP conference). Therefore, differences between groups in family functioning were not expected, and few differences were found. Only the Family Resource Scale was different at Posttest #1 and favored the augmented group. The Parental Stress Index, and the Family Adaptation and Cohesion Scale suggested no positive significant differences that favor the augmented group. At Posttest #2, there were no significant differences on any of the family measures. Posttest #3 results suggest that families in the basic group have less child-related stress than families of children in the augmented group. Twenty-one family measures were evaluated over the three posttests so that it may be more significant that only two showed significant differences over time.

It is clear that the augmented intervention was not cost-effective for children or families The augmented program cost $2,200 more than the basic program. For the children with mild and severe disabilities the additional services that were provided with this extra expenditure did not result in increased functioning and may have decreased their functioning relative to the children with similar disabilities who were in the basic program. Overall, the results of the current study suggest that a less intensive intervention training program is preferred over the more intensive training program that was implemented in the augmented program for paraprofessionals working with toddler-aged children with disabilities. There is one caveat, the augmented intervention did not impact child engaged behaviors even though it was effective in impacting teaching contexts and teacher behavior. The issue of child engagement deserves further emphasis in efficacy research and training programs. The findings of this study do impact on "best practice" beliefs (cf., Dunst et al., 1989; McDonnell & Hardman, 1988).

WABASH INTENSITY STUDY

Project #6

COMPARISON: Toddler-Aged Children with Mild Handicaps--5-day-per-week center-based program versus a home-based program that provides weekly visits.

LOCAL CONTACT PERSON: Connie Luthe, Program Coordinator, Wabash and Ohio Valley Special Education District

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LOCATION: Norris City, Illinois (Southeastern Illinois)

DATE OF REPORT: 4-9-1991

Rationale for the Study

A number of questions currently exist regarding the efficacy of early intervention for young children with disabilities (Casto & Mastropieri, 1986; Dunst, Snyder, & Mankinen, 1989). One of these questions concerns the intensity of the program in which the child participates. The common assumption for early intervention service is "more intense is better" (White et al., 1985-86). However, there is little evidence to confirm or refute this conventional wisdom for children with disabilities (Casto & Mastropieri, 1986; Dunst et al., 1989).

The intensity issue is a critical issue that speaks to program effectiveness and may directly affect funding and services. The recent passage of P.L. 99-457, although opening up service opportunities for a large number of previously unserved children, has placed additional financial demands on those organizations that provide intervention services. One area where the issue of effective services and funding is most pronounced is in regard to providing services to infants and toddler-aged children with disabilities. P.L. 99-457 has left these intervention services to state discretion, and funding issues are not well defined. In lieu of clear, experimental evidence regarding the intensity of programs, restrictive funding may force service provision agencies into apparently cost-effective, but experimentally untested, options. The purpose of this study was to investigate two common approaches, that vary greatly in intensity, for providing early intervention services to toddler-aged children with disabilities. The two approaches being contrasted are a home-based program that provides one weekly visit and a center-based program that provides services 5 days per week. Information from this empirical investigation, and others such as this, will provide a knowledge base for Part H program administrators, parents, and others when developing early intervention programs.

Review of Related Research

The most common service delivery model for infant and toddler-aged children with disabilities is the home-based model (Bricker, 1986). This model typically provides services on a 1-hour-per-week basis (Bricker, 1986) and generally takes one of two forms (c.f., Bailey & Wolery, 1981; Beller, 1979; Karnes & Zehrback, 1977): (a) services where an early interventionist visits the home (home visiting), or (b) services where parents and child visit an early interventionist at a center. Regardless of form, the services provided to both children and families are similar. These services usually consist of some form of developmental intervention for the child and the provision of parent support. Parents are usually provided training in intervention techniques and are expected to provide training to the child either through direct intervention or incidental teaching between visits.

The majority of evaluations conducted on home-based models has occurred with children at-risk for delay because of environmental or biological factors (GAO, 1990). Evaluations on interventions for these types of children have reported such positive outcomes as: better child health, improved child welfare, healthier babies at birth, and improved development (GAO, 1990). Unfortunately, as the GAO report makes clear, there is a paucity of studies that experimentally compare different home-based interventions or home-based intervention to other intervention strategies.

Research regarding the intensity of home-based models has focused primarily on varying the frequency of home visits. Burkett (1982) compared home visits for preschool-aged, at-risk children that occurred once per week vs. once every other week, vs. a group that received no visits. Burkett found no differences in child development between the experimental groups, but did find that both experimental groups made significant gains when compared to the no-visit group.

Powell and Grantham-McGregor (1989) compared home visiting services for toddler-aged at-risk children provided: once per week, once every two weeks, once per month, or not at all. In terms of cognitive development, significant differences were found in favor of the once-per-week and once-every-two-weeks groups over the other two groups. The once-per-month visit group was no different than the no-visit control group. Those visited weekly also demonstrated greater gains than those visited every other week.

The results from the home-based services reported above, which focus on at-risk children studies, are equivocal from an intensity perspective. The research from similar intensity comparisons using children with disabilities is not at all supportive of greater intensity programs. Studies, for children younger than three years of age, comparing one home visit per week vs. 2 per week (Lowitzer, Arkansas study, this report), and 1 per week vs. 3 per week (McLinden, SMA/Lake McHenry study, this report), did not find differences in child development or family functioning as a result of frequency of home visits. In a long-term study, Sandow et al. (1981) compared preschoolers with disabilities whose parents received home visits for a 3-

year period at either 2-week or 8-week intervals. After one year, children in the more frequently visited group made greater progress. By the end of the second year, the children in the less frequently visited group demonstrated greater progress. By the end of the third year, no group differences were found. Sandow et al. (1981) also compared the children who received home visits to children who received no intervention and found differences favoring both experimental groups over the no intervention group.

Other studies have focused on the intensity question for children younger than age 3 by combining home- and center-based intervention and comparing this combined intervention to a no-intervention group (Bryant & Ramey, 1987; Field, 1982; Infant Health and Development Program, 1990; Ramey & Bryant, 1983; Ramey, Bryant, Sparling, & Wasik, 1984; Seitz et al., 1985). These studies have all found positive differences in favor of the experimental group. These studies, however, all focused on at-risk children, and the center-based components were primarily daycare oriented. The most comprehensive of these studies (Infant Health and Development Program, 1990) did not find differential effects of intervention for children with IQs below 70. Comparisons of these studies to children with disabilities cannot be drawn, and the comparisons that can be gleaned do not support programs of greater intensity.

Studies that compare a center-based program without additional components to no intervention (Schweinhart & Weikart, 1980) or to a home-visiting intervention (Love et al., 1988) are rare. Schweinhart and Weikart found differences favoring the center-based program; but Love et al. found no differences between center-based and home-based intervention or a combined center and home intervention with preschool-aged at-risk children as subjects.

The studies reviewed above neither confirm nor refute the contention that more intensive services are better for children with disabilities. Support is provided for this contention with at-risk children (also see Bryant & Ramey, 1987; Dunst et al., 1989; Casto & White, 1985). It does appear that all children benefit from intervention. For children with disabilities who are younger than 3, the research does not support the "more intense is better" statement for home-visiting interventions. No research has addressed the comparison of home-visiting versus center-based interventions for these children. Although home-based programs are currently more common for children younger than 3 (Bricker, 1986), there are at least two reasons to compare home-visiting programs with center-based programs. First, increases in the labor force participation rates of mother's with very young children have greatly increased the number of families who cannot accommodate home visits during the day. Second, research, discussed above, on varying the frequency of home visits has not found increasing frequency of visits improves either children or family outcomes. Thus, if greater effectiveness is to be sought through more intense intervention, it may be necessary to change the delivery mode.

Overview of Study

The purpose of this study was to investigate one aspect of the question of intensity of programs that serve children with handicaps under 36 months of age, by comparing two early intervention programs of different intensity. Children in one group received 5-day-per-week, 2½ hours per day services in a classroom established to provide educational/developmental services for children with disabilities (center-based model). The children in the other group received 1-hour-per-week intervention services at home by a trained home intervenor (home-based model). Program efficacy was addressed by assessing child and family outcomes. The effect of intervention programs on families has been overlooked in the majority of early intervention studies (Casto & Mastropieri, 1986; Dunst, 1986; Dunst et al., 1989), but is an important area that should be considered (Bronfenbrenner, 1979; Dunst, 1986). It seems reasonable that the home- and center-based interventions might differ in their effects on parents.

Method

Program Organization and Background

This study was conducted in conjunction with the Wabash and Ohio Valley Special Education District (WOVSED). WOVSED provided special education services to nine counties in rural Illinois. State funding was granted to WOVSED to expand birth-to-3 intervention services while comparing home-based services for toddler-aged children with disabilities to center-based services (i.e., services provided in a classroom setting). Evaluation activities were augmented through the Early Intervention Research Institute. Although home-based services had been provided by the Illinois Division of Mental Health, conditions in the state grant to WOVSED required that all early intervention services be coordinated by WOVSED. A program coordinator was selected from WOVSED staff to coordinate all early intervention activities reported in this paper.

Collaborative activities between EIRI and WOVSED occurred for about two years. Research activities halted in November, 1987, due to varied concerns by the collaborating agencies. Although a larger number of subjects had been identified and were participating in the program, this paper presents data only on those children who had received pre- and post-assessments when collaborative activities halted.

Subjects

Twenty-six subjects are included in this study (13 in each group). The home-based group consisted of 9 males and 4 females; the center-based group of 6 males and 7 females. All subjects were classified developmentally delayed except for one subject in the center-based group who had cerebral palsy. Subjects age at pretest ranged from 8 months to 31 months.

Children who demonstrated a -1.5 standard deviation delay on any Battelle Developmental Inventory (BDI) (Newborg et al., 1984) domain were eligible for intervention services. Judgment of delay was based on a domain deviation score (domain age equivalent divided by chronological age). This is a liberal definition of disabled, and the study sample reflects this definition. Twelve of the 26 subjects demonstrated delays on less than 3 domains. Only 12 subjects demonstrated a -1.5 standard deviation delay on the BDI total score. Six subjects demonstrated a delay on all BDI domains. Delays were primarily exhibited on the BDI communication domain (19 of 26 children), the BDI personal-social domain (18 of 26), and the BDI cognitive domain (17 of 26). The mean deviation quotient for the study sample (and standard deviation) in these three areas were: personal-social--72 (SD = 22), communication--67 (SD = 18), and cognitive--75 (SD = 16). The mean deviation quotient for the BDI total score was 78 (SD = 14).

Recruitment. Study requirements narrowed the eligible study population to children from two counties served by WOVSED. All children who were eligible for WOVSED-provided early intervention services in these counties (based on the -1.5 standard deviation delay criterion) were considered for inclusion in this study. All parents were informed about the study and the intervention options. The home-based option was offered as the typically provided intervention program. Interested parents completed an informed consent procedure which stated that they were willing to allow their child to be randomly assigned to one of the program options. The informed consent form also described other features of the study (e.g., parent and program responsibilities, etc.).

Assignment to group. Two facilities in two different counties were established for the center-based program. Subjects were separated into two groups based, on geographic location, and were randomly assigned to either the home-based or center-based service program. Four levels of severity and two age breakdowns were established. The ages were: (a) 0-10 months, (b) 11-20 months, and (c) 21-31 months. Levels of severity were determined by Battelle total DQs and were: (a) severe, 0-52; (b) moderate, 53-68; (c) mild, 69-84; and (d) at-risk, 85+. Subjects were listed in each cell as parent permission to participate was obtained. The first placement in each cell was randomly determined, and placement alternated from that point according to several different randomly determined assignment patterns.

Demographic characteristics. The majority of children included in this study were Caucasian, and all spoke English as their primary language. The families of these children lived in a rural area where parents generally worked in unskilled occupations or were unemployed. The mean yearly income for these families was below $15,000. The majority of parents had some high school education. Demographic information for subjects and their families, by group, are presented in Table 6.1. Groups were not statistically significantly different on any of the major variables assessed (at $p \leq .05$).

Experimental Interventions

The two groups being contrasted are children who received either home- or center-based services. The following descriptions provide information on the groups.

Center-based group. Subjects in this group received 5-day, 2½ hour-per-day, programming in a classroom setting. Classrooms maintained an 8:2 child:staff ratio. Staff consisted of a certified teacher and a paraprofessional aide. Classrooms used a number of published curricula and emphasized instruction on developmental skills. Individual goals were established for each child based on a sequence of objectives that had been developed by the district. Teachers were responsible for program development for each student and for classroom schedules. Classrooms included social and group experiences in addition to time periods during which individual goals were addressed. Daily sessions typically included group activities for music and language development, free play, self-help skills development, and individual child goals.

Table 6.1

Comparability of Groups on Demographic Characteristics for Wabash Intensity Study

	Home-Based			Center-Based				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value**	ES^
• Age of child in months at pretest	24.1	(5.5)	13	22.7	(7.9)	13	.61	-.25
• Age of mother in years at pretest	28.5	(5.7)	12	25.1	(5.3)	9	.18	-.60
• Age of father in years at pretest	31.9	(7.9)	12	27.4	(3.7)	11	.08	-.57
• Percent Male*	69.2		13	46.2		13	.25	-.51
• Years of Education for Mother	11.5	(1.3)	12	11.6	(1.8)	9	.93	.08
• Years of Education for Father	11.5	(2.7)	11	12.3	(1.4)	12	.43	.30
• Percent with both parents living at home*	75		12	66.7		12	.67	-.20
• Percent of children who are caucasian*	90.9		11	81.8		11	.56	-.28
• Hours per week mother employed	5.0	(14.1)	8	14.2	(19.5)	9	.29	.65
• Hours per week father employed	33.0	(20.8)	8	26.3	(17.1)	12	.43	-.32
• Percent of mothers employed as technical managerial or above*	0		10	0		9	--'	.00
• Percent of fathers employed as technical managerial or above*	0		10	0		12	--	.00
• Total household income	$14,955	($7,521)	11	$11,417	($6,898)	12	.25	-.47
• Percent with mother as primary caregiver*	82		11	70.0		10	.55	-.31
• Percent of children in daycare on a daily basis*	18		11	0		11	--	-.69
• Number of siblings	1.8	(1.1)	12	2.1	(1.9)	12	.61	.27
• Percent with English as primary language*	100		12	100		12	--	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

** All p values are from t-tests conducted between groups.

^ $$ES = \frac{\bar{x}\text{ (center-based)} - \bar{x}\text{ (home-based)}}{SD\text{ (Home-Based)}}$$

ESs from percent variables were obtained from a probit transformation. The sign of the effect size is only meant to indicate direction of result. No value judgements are implied.

' "--" indicated that the t-test could not be completed because of no variance in one group.

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The children in the classroom were offered an evaluation by occupational, physical, and language therapists, but these services were not provided as part of the center-based program. Parents could, however, contract privately for these services if they wanted. Transportation to and from the classrooms was provided by the district. Teachers kept parents informed of their child's progress through phone contacts and individual notes sent home. The center-based program operated for 9½ months, with a break from June 15 to August 15.

Home-based group. Subjects in this group received once-per-week, 1-hour home visits by one of two early intervention program staff. The two home teachers were employed by the Illinois State Division of Social Services and had bachelor's degrees, but were not certified teachers. Home visitors were under the supervision of the special education district. Using the pretest measures, the home teacher and parents developed an Individual Education Plan (IEP) for the child that focused on developing language, motor, self-help, and cognitive skills. The home teacher, when doing home visits, worked primarily with the child on these IEP goals. Parents were encouraged to observe these program activities and were trained in program implementation. Parents were expected to work with their child between visits. As a secondary activity, home teachers worked with the parents to provide support and information on child development, and to help them access additional community services. A family service plan, based on these types of activities, was developed for each family. As with the center-based services, contracting additional services (e.g., therapies) was the responsibility of the parent. The home program provided services throughout the year.

Treatment Verification

Verification of the independent variable should be an aspect of all experimental research. The failure to obtain these data can potentially result in an erroneous conclusion (Barnett et al., 1987; Cooke & Poole, 1980). A variety of data were collected for treatment verification purposes. These included: (a) teacher (interventionist) ratings of parents' attendance, knowledge, and support based on their interactions with parents be it at home or school; (b) a general health rating of the child completed by the parent which addressed various health issues as well as general health; (c) an estimate of time parents spent working with their children on program-related activities on their own time; and (d) parent reports of hours of therapies and services received outside the program in which they were involved. All of these measures, except the estimate of parent time on program-related activities, were collected at posttest. The collection of parent time estimates is discussed later. T-tests were conducted with these data, and no differences were found between groups (Table 6.2).

Table 6.2

Treatment Verification Data for Wabash Intensity Study

	Home-Based			Center-Based					
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	t	ES[-]	P Value
Teacher rating of:[*]									
Parent Attendance	2.2	(.9)	10	2.2	(.8)	13	.13	.00	90
Parent Knowledge	1.6	(.7)	10	1.7	(.5)	13	-.38	.14	71
Parent Support	2.0	(.9)	10	2.2	(.7)	13	-.66	.22	51
General Health[@]	2.2	(.4)	10	1.9	(.5)	12	1.39	-.75	.18
Total Hours Additional Services (Pre-Post)[#]	17.9	(47.2)	7	9.3	(23.8)	11	.45	-.18	67

[*] Teacher rating is based on a 3-point scale where higher scores indicate a better rating

[@] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

[#] Data are based on parent report obtained at posttest. These data represent parent report of time the child received speech therapy, motor therapy, tutorial activities, and family receipt of social work services outside of the home-/center-based intervention

[-] Effect Size (ES) is defined here as the difference between the group means (Center-Based minus Home-Based) divided by the standard deviation of the Home-Based Group.

Efforts were made to determine how much time parents in each group spent working with their child on enhancing the child's developmental growth. Parents were asked to return a preprinted postcard each week indicating the amount of time they had spent working on areas suggested to them by the early intervention program staff.

During the 1986-87 academic year, 24 postcards were given to parents to return. Seven parents in the home-based group returned postcards; 11 parents in the center-based group returned postcards. Parents returned an average of 64% of postcards sent. The data from these postcards is presented in Table 6.3. The results suggest that parents in the two groups did not spend different amounts of time working at home with their child on program-related activities.

Table 6.3

Information Obtained from Parent Postcards Describing Time Parent Spent Working With Child on Intervention Program Related Activities for Wabash Intensity Study

	Home-Based				Center-Based					
	$\bar{x}$	(SD)	Range	n	$\bar{x}$	(SD)	Range	n	p Value	ES[*]
Number of Cards Returned of 24 Possible	14.0	(6.9)	4-22	7	15.6	(8.4)	6-24	11	.67	.23
Average Minutes Per Week Spent Working With Child	116.7	(58.7)	151-196	6[*]	139.3	(70.9)	40-272	11	.52	.39

[*] $$ES = \frac{\bar{x}\text{ (center-based)} - \bar{x}\text{ (home-based)}}{\text{SD (home-based)}}$$

[*] Data from one parent was excluded because it was an extreme outlier. This parent reported over 20 hours spent working at home per week. Analysis including this variable does not alter the finding of no significant differences (p = .43).

Parent satisfaction. Data about parent satisfaction regarding the intervention program in which they participated are presented in Table 6.4. These data were obtained from an EIRI-developed questionnaire that uses a 4-point Likert scale (4 = highest satisfaction). Parents of children in the home-based group were significantly more satisfied with their child's intervention program in the areas of their participation in the program, the treatment program in general, and on a combined score of all questions from the parent satisfaction questionnaire. It should be made clear that all parents expressed overall satisfaction with their respective program; all scores but one were 3 or above on the 4-point scale.

Table 6.4

Parent Satisfaction Data for Home-Based and Center-Based Groups for the Wabash Intensity Study

	Home-Based			Center-Based					
Parent Satisfaction With:	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	t	ES[^]	P Value
Staff	3.8	(.4)	9	3.4	(.5)	10	1.70	-1.00	.11
Communication with Staff	3.7	(.5)	9	3.2	(.9)	10	1.35	-1.00	.19
Program Goals & Activities	3.7	(.5)	9	3.6	(.5)	10	.29	-.20	.78
Parent Participation	3.7	(.5)	9	2.4	(1.1)	10	3.35	-2.60	.005
Range of Services	3.7	(.5)	9	3.2	(.6)	10	1.77	-1.00	.10
Progress of Child	3.7	(.5)	9	3.7	(.5)	10	-.15	0.00	.88
Program in General	3.8	(.4)	9	3.2	(.6)	10	2.28	-1.50	.04
Total	25.9	(2.3)	9	22.7	(3.6)	10	2.28	-1.39	.04

[^] Effect Size (ES) is defined here as the difference between the group means (Center-Based minus Home-Based) divided by the standard deviation of the Home-Based Group.

Site review. Another aspect of treatment verification was a site review. The purpose of this review was to collect information about the nature and quality of early intervention services that were being delivered, to verify that interventions were being implemented as intended, and to collect needs assessment data that may have been useful to the site. A site review visit was conducted in June 1987. Both the center- and home-based programs were visited. The summary of the site review indicated that intervention services were being appropriately delivered, but raised concerns regarding qualitative aspects of both service delivery formats. These concerns were related to "best practice" issues, as services being provided were appropriate.

Data Collection

Parents of each subject who participated in the study provided demographic information. All children were administered the BDI (Newborg et al., 1984). The BDI measures five developmental domains: personal-social, adaptive, motor, communication, and cognitive. A total BDI score, based on all domains, can also be determined. The BDI was used to assess child outcomes for each of the studies being conducted by EIRI. This measure was selected for use based on the findings of an expert panel convened to help EIRI determine appropriate measures. (More information on the BDI and other EIRI measures may be found in the EIRI 1987/88 Annual Report.) The BDI was administered at pre- and posttest.

In addition to the BDI, the Minnesota Child Development Inventory (MCDI; Ireton & Thwing, 1972) was administered at posttest to measure child outcomes. This test was selected because it is completed by the parent; where home-based services were provided at home, it was possible that child improvements may have been more prominent in the home setting rather than when exhibited in a structured test situation. The MCDI assesses seven areas of development: general development, gross motor skills, fine motor skills, expressive language, comprehensive communication, situational comprehension, self-help skills, and personal-social skills.

Parents of children in the study completed the following scales of family functioning: Parenting Stress Index, Family Resource Scale, Family Support Scale, Family Adaptability and Cohesion Evaluation Scale III, and the Family Inventory of Life Events. These measures are described in Table 6.5. All these measures were administered at posttest. The PSI, FSS, and FRS were also administered at pretest. As discussed earlier, family functioning has been an overlooked variable in early intervention research (Casto & Mastropieri, 1986; Dunst, 1986). Although, theoretically, it is assumed early intervention will effect families (Bronfenbrenner, 1977), the specific areas that may be impacted are unknown and may vary depending on type of intervention. This battery of family functioning measures was used to elucidate areas of functioning that may be affected.

Recruitment, training, and monitoring of diagnosticians. All diagnosticians were required to pass an EIRI designed diagnostician certification course prior to administering tests. Certification involved a demonstration of competency with the BDI and familiarization with EIRI procedures. Diagnosticians were unaware of subject

Table 6.5

Family Measures for Wabash Intensity Study

MEASURES	DESCRIPTION
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.

group placement. In addition to the training, all protocols were checked for errors by EIRI staff upon receipt. Both pre- and posttesting occurred at a center that was centrally located to all programs but not involved in the study. This ensured that the testing setting was equally familiar for all subjects.

Pretest. Subjects involved in this study were enrolled on a continuous basis. That is, as children were referred for assessment for placement in intervention services, they were tested and, if appropriate, enrolled in the study. Children were initially identified for placement in this study during the latter part of the 1985/86 school year. Children continued to be identified through summer, 1986, and the initial part of the 1986/87 school year. All children were administered the pretest BDI prior to enrollment in the study. Mothers completed the family measures and the demographic form following the administration of the BDI. The research study was discussed with parents of children who were determined eligible for intervention services. If interested, they completed an informed consent form. Once in the study, parents were offered an incentive of $20 for completing the pretest battery.

Posttest. All posttests were administered by a diagnostician who was unaware of subject group placement. Parents brought their child to a center for testing. Following test administration, parents completed the MCDI, the family measures, the demographic forms, and other information related to treatment verification. Parents were again given an incentive of $20. Posttesting occurred in May 1987 or earlier for children who transitioned to preschool-aged intervention services. Only children who had been enrolled in intervention for a minimum of 6 months were scheduled for posttesting.

Results and Discussion

This study examined the effects on the children and their families of once-per-week home-based versus 5-days-per-week center-based intervention service to toddler-aged children. The following sections present the results of that comparison.

Comparability of Groups on Pretest Measures

Group differences on pretest measures were compared using t-tests and are presented in Table 6.6. Subjects in the home- and center-based groups were comparable on all BDI domains, on the BDI total score, and for chronological age of child at pretest. Parents of subjects in the center-based training had more child related stress (at $p \leq .10$) than parents of subjects in the home-based training group; on the other PSI domains (other stress and total stress), the parents reported similar stress. Family support (FSS) and resources (FRS) were comparable. These results suggest that the groups were comparable at pretest.

Table 6.6

Comparability of Subjects on Measures of Child and Family Functioning for Wabash Intensity Study

	All Subjects Included in Analysis							
	Home-Based			Center-Based				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[$]
• Age of child in months at pretest	24.1	5.5	13	22.7	7.9	13	.81	-.25
• **Battelle Developmental Inventory (BDI)**[+]								
DQs for:								
Personal-Social	72.6	24.6	13	71.8	20.0	13	.63	-.03
Adaptive Behavior	83.3	17.1	13	75.1	26.2	13	.20	-.48
Motor	88.5	14.3	13	87.0	23.9	13	.35	-.10
Communication	68.5	19.5	13	65.9	17.0	13	.40	-.13
Cognitive	76.6	15.0	13	73.4	17.6	13	.40	-.21
TOTAL	79.8	12.6	13	77.1	16.1	13	.35	-.21
• **Parenting Stress Index (PSI)**[#]								
Child Related (range 50 to 250)	111.8	16.0	12	128.6	30.3	13	.09	-1.05
Other Related (range 54 to 270)	141.7	14.1	12	144.5	34.2	13	.79	-.20
TOTAL (range 101 to 504)	254.3	22.8	12	273.1	62.2	13	.33	-.82
• **Family Resource Scale (FRS)**[&] (range 30 to 15)	105.3	15.6	10	115.5	17.1	12	.16	.65
• **Family Support Scale (FSS)**[&] **Total Score** (range 0 to 4)	1.0	.7	9	1.2	1.0	12	.74	.29

[+] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing. P values are from the raw score analyses, but ES's are from the DQ scores.

[&] Analyses for FSS and FRS are based on raw scores, indicating number of supports or resources indicated by the family as being available. For the FSS, the score represents the sum of perceived support divided by number of reported sources of support. Higher scores are considered better.

[#] Analysis for the PSI is based on raw scores. Lower scores are considered better.

[$] $ES = \frac{\bar{x} \text{ (center-based)} - \bar{x} \text{ (home-based)}}{\text{SD (Home-Based)}}$

Measures of Child Functioning

Results of posttest data analysis on child functioning are presented in Table 6.7, which shows the effects of alternate forms of intervention on measures of child functioning. Results presented for each measure in Table 6.7 are based on an analysis of covariance completed using SPSS-PC. Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretests and demographic variables were considered as potential covariates. For this study, number of months between pretest and posttest and length of intervention were also considered as possible covariates. The final selection of covariates depended on a judgment (based on correlation and multiple regression procedures) of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question. In each analysis, the specific covariates used are indicated in the table.

Results of the analyses reported in Table 6.7 demonstrate statistically significant effects ($p < .10$) of intervention on the personal-social, communication,

Table 6.7

Posttest Measures of Child Functioning for Home-Based and Center-Based Groups for the Wabash Intensity Study

Variable	Covariates[#]	Home-Based $\bar{x}$	Home-Based (SD)	Home-Based Adj. $\bar{x}$	Home-Based n	Center-Based $\bar{x}$	Center-Based (SD)	Center-Based Adj. $\bar{x}$	Center-Based n	ANCOVA F	p Value	ES[~]
Average length of intervention in months[&]	--	7.9	(2.8)	---	13	8.4	(1.3)	---	13	1.12	.30	.18
Age in months at posttest	--	32.0	(7.0)	---	13	33.0	(8.0)	---	13	.05	.83	.14
Battelle Developmental Inventory (BDI)[*]												
Personal-Social	1	75.0	(20.0)	73	13	82.0	(23.0)	84	13	4.38	.05	.55
Adaptive Behavior	2	61.0	(10.0)	58	13	57.0	(12.0)	59	13	.23	.64	.10
Motor	3	83.0	(11.0)	80	13	80.0	(21.0)	83	13	1.16	.29	.27
Communication	4	39.0	(8.0)	38	13	41.0	(8.0)	42	13	3.43	.08	.50
Cognitive	5	33.0	(9.0)	32	13	35.0	(9.0)	36	13	3.31	.08	.44
Total	6	290.0	(53.0)	279	13	295.0	(68.0)	306	13	10.01	.00	.51
Minnesota Child Development Inventory (MCDI)[*]												
General Development	6	84.0	(16.0)	79	9	80.0	(28.0)	86	10	.62	.44	.44
Gross Motor	6	26.0	(4.0)	25	9	24.0	(7.0)	25	10	.01	.91	.00
Fine Motor	6	31.0	(4.0)	30	9	31.0	(4.0)	32	10	1.68	.21	.50
Expressive Language	6	41.0	(7.0)	39	9	39.0	(12.0)	41	10	.23	.64	.29
Comprehensive Communication	6	30.0	(11.0)	27	9	32.0	(14.0)	35	10	3.18	.09	.73
Situational Comprehension	6	28.0	(7.0)	26	9	30.0	(9.0)	31	10	2.46	.14	.71
Self-Help	6	26.0	(4.0)	24	9	23.0	(8.0)	24	10	.00	.98	.00
Personal-Social	6	24.0	(7.0)	23	9	25.0	(8.0)	26	10	1.69	.21	.43

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[*] Statistical analysis for BDI and MCDI scores were conducted using raw scores for each of the scales.

[~] Effect Size (ES) is defined here as the difference between the groups (center-based minus home-based) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Home-based Group.

[&] Enrollment in intervention was continuous throughout the year. Therefore, some children that were pretested immediately prior to or during the summer and who were selected for the center-based option did not begin receiving services until August. This measure represents actual time the program was in effect.

[#] Covariates: 1 = BDI Personal-Social; 2 = BDI Adaptive Behavior; 3 = BDI Motor; 4 = BDI Communication; 5 = BDI Cognitive; 6 = BDI Total

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and cognitive domains of the BDI, and on the total BDI score. All group differences favored the center-based intervention group. Effect sizes suggest educational differences on these domains. Parent reports of child development, based on the MCDI, did not find statistically significant differences between the groups except on the MCDI subscale of comprehension-communication, in favor of the center-based group.

When using a sample size as small as that used in this study, findings of statistical significance with a $p < .10$ suggest that groups were impacted differentially. These differences are clear in all areas on the BDI except motor and adaptive behavior skills. Although the MCDI did not show significance, except on one domain, the average ES for the MCDI was .44. This indicates a positive impact in favor of the center-based group. If the gross motor and self-help domains are not included (because they are not supported by the BDI findings), the average MCDI ES is .58. Overall, these findings strongly suggest group differences in favor of the center-based group occurred as a result of intervention.

Measures of Family Functioning

Table 6.8 presents effects of intervention on measures of family functioning. Analyses of covariance was used for the PSI. Analysis of variance was not used with other family measures because variables which would have been useful as covariates (based on the described covariate selection procedures) were not available at pretest for all subjects. Therefore, the effect of using these would be to decrease the sample size. Except for the FILE, no differences between the two groups were found on measures of family functioning and parent stress. These results suggest that the alternate forms of intervention did not have a significant effect on parent stress, family resources, or perception of family toward an "ideal." The significant result from the FILE is difficult to interpret. The finding indicates more significant life events occurred to parents of subjects in the center-based training.

Table 6.8

Posttest Measures of Family Functioning for Home-Based and Center-Based Groups for the Wabash Intensity Study

	Home-Based					Center-Based							
	x̄	(SD)	Adj x̄	%ile**	n	x̄	(SD)	Adj x̄	%ile**	n	ANOVA F	p Value	ES
Parent Stress Index (PSI)$$													
Child Related	108.3	(13.9)	113.3	79	11	114.7	(26.7)	109.6	75	13	28	60	27
Other Related	140.6	(19.4)	141.2	80	11	140.0	(30.8)	139.4	77	13	12	73	09
Total	248.9	(21.6)	249.8	80	11	254.7	(54.6)	253.8	82	13	18	67	19
Family Support Scale (FSS)*	1.5	(.7)	...		9	1.9	(.8)	...		13	1.84	19	57
Family Resource Scale (FRS)+	108.2	(25.1)	...	32	10	111.1	(13.8)	...	37	13	12	73	12
Family Adaptation and Cohesion Evaluation (FACES)													
Cohesion	3.8	(2.0)	...	...	11	3.5	(4.2)	...	...	12	04	85	15
Adaptation	3.5	(2.3)	...	...	11	4.3	(2.9)	...	...	12	49	49	-35
Total	5.6	(2.0)	...	...	11	6.4	(3.8)	...	...	12	34	57	-40
Family Inventory of Life Events (FILE)$	10.7	(5.3)	...	34	11	17.0	(5.6)	...	10	11	7.38	.01	-1.19

~~ Effect Size (ES) is defined here as the difference between the group means (center-based minus home-based) divided by the unadjusted standard deviation of the Home-based Group. For the PSI, FILE, and FACES, the numerator for the ES was calculated as: Basic-Adjusted, as lower scores are preferred. For the PSI, the ANCOVA adjusted scores were used in the ES.

$$ Analyses for the PSI are based on raw scores. Lower scores are considered better. Results are based on an analysis of covariance. Covariates included pretest domain scores for the child and other related domains and the pretest PSI other related scale and length of intervention for the total score.

* Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

~ Scores for each subscale of the FACES are derived from the "ideal" score reported in the manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

$ Analysis for the FILE is based on raw scores. Lower scores are considered better.

+ Analyses for the FRS is based on raw scores where higher scores indicate greater resources.

** Although analyses were based on raw scores, percentile information is presented for ease of interpretation on the PSI, FRS, and FILE. Percentile information is based on the raw score or adjusted raw score and was obtained from data collected across all EIRI longitudinal studies for the FRS. Percentile information for the PSI and FILE are based on the authors' normative sample. For the PSI, higher percentiles indicate greater stress; for the FILE, higher percentiles indicate lower stress.

Effect of FILE results on analyses. It is possible that the differential life events that occurred between groups may have impacted on the other family or child outcome measures. To examine this possibility, the procedure to select covariates was repeated including the FILE as a variable. The only measures on which the FILE was determined to be an appropriate covariate were the child and other related domains of the PSI and the Family Support Scale. The effect of using this variable as a covariate on these measures is presented in Table 6.9. These results do not change the earlier finding of no differences between groups on these measures.

Table 6.9

Posttest Measures of Family Functioning Including the FILE as a Covariate for Home-Based and Center-Based Groups for the Wabash Intensity Study

Variable	Covariates[♦]	Home-Based $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile[**]	n	Center-Based $\bar{x}$	(SD)	Adj. $\bar{x}$	%ile[**]	n	ANOVA F	P Value	ES[^]
Parent Stress Index[♣] (PSI)														
Child Related	1,2	108.3	(13.9)	111.3	76	11	116.5	(28.8)	113.4	79	11	.14	.71	-.15
Other Related	1,3	140.6	(19.4)	140.6	80	11	143.5	(31.7)	143.6	82	11	.30	.59	-.15
Family Support Scale[•] (FSS)	1	1.5	(.7)	1.6		9	1.7	(.5)	1.6		11	.00	.98	.00

[^] Effect Size (ES) is defined here as the difference between adjusted group means (center-based minus home-based) divided by the unadjusted standard deviation of the home-based group. For the PSI, the numerator for the ES was calculated as: home-based minus center-based adjusted means, as lower scores are preferred.

[♣] Analyses for the PSI are based on raw scores. Lower scores are considered better.

[•] Analysis for the FSS is based on a total score calculated by dividing the sum of perceived support by total number of sources. Higher scores are considered better.

[♦] Covariates: 1 = FILE Score at posttest; 2 = PSI child-related score at pretest; 3 = PSI other related score at pretest.

[**] Although analyses were based on raw scores, percentile information is presented for ease of interpretation on the PSI. Percentile information for the PSI is based on the authors' normative sample. Higher percentiles indicate greater stress.

Conclusions

This study demonstrated that a center-based, early intervention program for toddler-aged children who with mild disabilities was more effective than a less intensive home-based program. These results address some concerns that have been raised regarding the intensity of early intervention services (e.g., Casto & Mastropieri, 1986). More intensive services provided to children with mild disabilities who were less than 36 months of age was effective in producing statistically significant and educationally meaningful developmental gains on measures of child functioning. These interventions appeared to have no differential impact on parent stress levels or family functioning. Parents of subjects in the center-based group were found to have more significant life events occur to them while their child was enrolled in intervention.

An issue indirectly addressed by this study is related to differences in program structure as well as intensity. It is evident that the interventions used in this study differed in structure as well as intensity. In fact, it would be difficult, and inappropriate from an intervention perspective, to provide the same structure when the intensity difference is 1:12.5, as it was in this study. In some respects, though, the programs were similar. Children in both groups had individual program plans developed using the same assessments, and the early interventionist (teacher or home visitor) was the responsible person for addressing child goals. Other aspects of the programs differed, and such differences can only be expected based on the two different models used.

If the structure of programs, as well as intensity, becomes the major concern of research efforts, then it behooves researchers to develop instruments for assessing process variables. Such an instrument has been developed for preschool classrooms (Carta et al., 1988) and adapted for use in toddler-age classrooms (Atwater et al., 1988). A similar instrument is needed for use in the home-based model. This type of instrument would greatly aid research that has examined frequency of visits (Burkett, 1982; Lowitzer, 1990; McLinden, 1991; Sandow et al., 1981), such that frequency alone is not the only known independent variable. Effective processes, once identified, could then be compared across models.

The results of the treatment verification data raise an interesting point. It was found that there were no group differences on parent reports of time spent working at home with their child, on their own, on what parents considered program related activities. This clearly violates one assumption behind the home-based model, which suggests activities parents learn during home visits will be done regularly without the presence of the home visitor. If parents do not comply with this assumption, then the child outcomes of this research are not surprising.

The question that must be asked then is: Were these parents different from or typical of parents who are enrolled in home-based programs? Parents can be encouraged to do activities at home (e.g., Shearer & Shearer, 1976). High rates of parent activities are generally noted with the home-based model, demonstration type projects. Other research has demonstrated that parents are unwilling to regularly engage in activities they see as structured (Culatta & Horn, 1981; McDonald, Blott, Gordon, Spiegal, & Hartman, 1974). In the interim report of the Sandow et al. (1980) study (Sandow & Clark, 1978), it was hypothesized, based on their two-year finding that less frequently visited children were showing greater improvement, that the less frequent visits forced parents to rely more on themselves rather than waiting for, and relying on, the home visitor to do everything for the parents. Regardless of parent motivation (or lack of it), it is clear that the involvement of parents in their child's program, when the home trainer is not there, requires greater emphasis in research and practice.

The importance of parent satisfaction in early intervention programs has been proposed as a variable of great importance (Strain, 1988). Clearly, consumer satisfaction must be considered in any program. The results from the parent satisfaction data in this study indicate that the parents whose children made less progress were more satisfied with their program. Philosophically, it must be asked, "is the goal of early intervention to increase child outcomes or to satisfy parents (perhaps empowering them)" (Dunst, 1986). Both are reasonable goals, and they are not mutually exclusive. The failure of other family and parent measures used in this study to demonstrate any group differences to support the parent satisfaction findings raises questions about the adequacy of measures assessing parents and families as they are being used in early intervention research.

Three major weaknesses are also apparent in this study. One is related to the degree of disability exhibited by the children. The majority of subjects in this study, although qualifying for services, has mild disabilities. A similar comparison involving moderately to severely delayed children may have resulted in other findings. A second weakness is related to the lack of more detailed treatment verification data. Data that addressed actual amount of intervention received and the focus of intervention activities (i.e., process data) would enhance the generalizability. The failure to obtain these data requires that conclusions be guarded because of the potential for erroneous conclusions. The final weakness is that the research is not longitudinal. It is not known if, or for how long, these child outcome differences will endure. As with the Sandow et al. (1981) study, initial difference may not maintain in future years.

This study does suggest that center-based model services for toddler-aged children with mild disabilities can be effective and was more effective than a home-based model service option. Support is provided to the contention that "more intense is better" and that center-based model services provided at the toddler ages can be effective. Also, varying interventions can differentially effect toddler-aged children, suggesting that the age-at-start issue (i.e., when children begin intervention) must be examined in light of interventions known to be the most effective. It is clear that this is only one of many needed studies to help complete the puzzle regarding knowledge of early intervention efficacy. From a practical perspective, this study suggests that more intensive center-based model services appear to be the preferred service option for toddler-aged children with mild disabilities. This information needs to be considered by decision makers when requesting funding and by those training early interventionists.

BELLEVILLE PROJECT

Project #7

COMPARISON: Mildly to Severely Handicapped Children--Treatment vs no treatment

LOCAL CONTACT PERSON: Kathleen Cullen, Program Director

EIRI COORDINATOR: Kathryn Haring (10/85 - 9/87); Martin Toohill (10/88 - 10/89)

LOCATION: Belleville, Illinois

DATE OF REPORT: 4-9-1991

Rationale for the Study

Although there is a widespread belief that early intervention will have beneficial effects for children with disabilities, very little well-designed research exists to support this belief. Almost all of the existing research is either poorly designed (see Dunst & Rheingrover, 1981, for a discussion of the methodological shortcomings with existing research with children with disabilities), or done with disadvantaged children (e.g., Berrueta-Clement et al., 1984; Ramey & Haskins, 1981). In spite of the paucity of research evidence, program administrators must still make decisions about whether to provide early intervention services; if so, what type of services and what intensity of services to provide. Although a single study cannot answer such a complex question, it is important to begin establishing an empirical basis to guide programmatic decisions about early intervention. The purpose of this study was to compare the effects on child and family functioning variables for preschool children with disabilities who received home-based early intervention services with those who received no home-based services.

Review of Related Research

Few, if any, early intervention studies have been done with children with disabilities which make a treatment versus not treatment comparison. Studies which have examined the effects of different intensity levels of intervention are certainly relevant to the issue. If early intervention has a beneficial effect, it seems reasonable that the more intensive the intervention, the greater will be its impact. Unfortunately, very few studies have been identified that directly tested this assumption among children with disabilities. In a study by Sandow et al. (1981) using a quasi-experimental design, children with severe intellectually disabilities were matched and assigned to either a high intensity (2-3 hours every two weeks) or low-intensity (2-3 hours every two months) home-based intervention and compared to a no-treatment control group. Outcome IQ measures were obtained by the authors. While the high-intensity group demonstrated greater IQ gains after one year (ES = 0.55), the low-intensity group equalled the high-intensity group in terms of IQ gain in the second year of the study. There was no difference between the two groups after three years. Both groups made greater gains than the no-treatment control group after three years (ES = 0.47 and 0.37, respectively).

In a study by Jago et al. (1984), 24 language-delayed children aged 18-36 months were matched for age and etiology (all but two were diagnosed as having Down syndrome) and assigned to one of two levels of a center-based intervention. The high-intensity intervention group received 7.0 hours of weekly services in which total communication was stressed continuously and parents and children were encouraged to engage in exploratory play activity. The low-intensity intervention group received an average of 2.5 hours of weekly service in which total communication was taught for only 5-10 minutes per session. After seven months of treatment, children in the high-intensity group increased their number of acquired signs fivefold while the low-intensity group increase was only 16%. However, there were no statistically significant differences on a developmental measure. In addition, the authors noted that the high-intensity intervention was confounded with the greater number of teacher hours subjects received in that group.

The above two studies illustrate methodological shortcomings of early intervention efficacy research as described by White and Casto (1985)--experimental designs were not randomized, data was not impartially obtained, there was no description or documentation that the intended treatments were actually delivered, and, at least in the Sandow et al (1981) study, and there was no discussion of whether the outcome measure used (IQ) was the most appropriate. Regardless of the results, these threats to the internal validity of the experiments make it difficult, if not impossible, to draw any firm conclusions. In summary, little empirical data exists that clearly supports or refutes the assumption that more preschool intervention programs for children with disabilities will positively affect developmental progress.

Overview of Study

This study addressed some of the deficiencies listed above. Children ranging in age from 4 months to 29 months with a variety of disabilities were randomly assigned to either a home-based intervention condition (treatment group) or a no-intervention condition (control group). Children in both groups were assessed by "blind" diagnosticians over a period of 9-13 months using a standardized developmental measure to assess the efficacy of the intervention.

Methods

The Belleville Project was conducted by a private state-funded facility in Illinois that offered services to individuals with disabilities from birth to 21 years of age. There were vocational work and classroom programs at the site. The home-based treatment program provided services to children birth to 3 who were identified as disabled. A home teacher or intervenor served as the coordinator of the home-based program which served a two-county, primarily rural, Caucasian population. Funding for this home-based intervention, the only section of the agency's program that participated in this longitudinal study, was provided by a grant from the State of Illinois as a part of the Preschool Pilot Program funding initiative. Prior to this state funding, the facility only offered center-based intervention and many birth to 3-year-old children in this rural area did not receive services.

Subjects

As a part of this research project, the facility expanded services to two counties in which no early intervention services were being provided for children 0 to 3. County-wide screenings were conducted with a goal of identifying 60 infants abd toddlers with mild to severe disabilities between these ages. Originally, state money was provided for the purpose of offering services to a random half of these subjects (i.e., 30 children). Justification for doing a randomized study was that there would be more children who needed services than available financial resources to provide those services. Therefore, random assignment to groups was a fair way to decide which children would receive services. However, after more than one year of extensive recruitment efforts, only 24 children had been recruited for the study, 12 of whom received services. At that point, the state funding agency decided that it could no longer justify withholding direct services from the control group since there was sufficient money to provide full services to all the children who had been identified. The decision was made to terminate the comparative research and provide full services to all children.

Assignment to groups. Identified subjects were randomly assigned to either the treatment or control groups. For each child included in the study, parents signed a consent form agreeing to participate in either the treatment or control conditions. Group assignment took place in two stages. Subjects were stratified according to age and severity of disability (mild, moderate, or severe) and then randomly assigned. Assignment procedures are explained in more detail in the 1986-1987 Annual Report. Group assignments were made by the EIRI coordinator to ensure that no program staff had knowledge of where a particular incoming child would be placed.

Subject attrition. The home-based treatment had been implemented for only seven months when the comparative study was terminated due to low enrollment. At that time, all subjects were posttested. Because not all subjects had been pretested at the same time, with some having been pretested five months before the actual start-up of the treatment, there was a range of pretest-posttest intervals (3-13 months). It was decided that a nine-month pretest-posttest interval was the minimum amount of time to assess significant developmental change as well as to assess any effects of the intervening treatment program. Three subjects did not meet this criterion. A fourth subject had moved and could not be located for posttest. Thus, of the 24 subjects recruited for the study, only 20 were included in the posttest analysis.

The pretest mean BDI scores of the four subjects not included in the posttest analysis (three Controls, one Treatment) were virtually identical to the pretest mean BDI scores of the 20 subjects who were included. Also, the individual pretest scores of these four subjects did not significantly deviate from the pretest mean scores of the respective group to which each of the four subjects had been assigned. Thus, it appears that the 20 subjects included in the posttest analysis were comparable to the original sample of 24 at least in terms of pretest BDI scores. The disabilities for these 20 children are listed in Table 7.1.

Table 7.1

Frequency of Disability for Belleville Project

Variable	Subjects Included in Posttest Analysis	
	Control Group	Treatment Group
Motor Impaired	1	0
Language Impaired	1	2
Developmental Delayed	5	4
Multihandicapped	2	1
Cerebral Palsy	0	4
TOTAL	9	11

Demographic characteristics. For the 20 subjects who were post-tested, 19 were Caucasian and one was Black. Income ranged between $15,000 and $20,000 annually. The mean number of years of education for mothers and fathers was 12.7 and 13.1, respectively. The subjects primarily resided in rural areas of western Illinois. Descriptive data for subjects who were included in the posttest analysis are presented in Table 7.2. Incomplete data for the father-related variables was attributable to the fact that some subjects from both groups came from households in which the father was not present.

The only variables for which there were statistically significant differences ($p < .10$) between groups were the number of siblings and the percent of fathers employed in technical/managerial positions. Given the number of statistical tests of significance conducted, one expects some group comparisons that are statistically significant even if the null hypotheses were true. At the same time, with the small number of subjects in this study, the power to detect statistically significant differences if the null hypothesis were not true is minimal. An examination of the effect sizes for the posttested subjects in Table 7.2, some of which are positive and some negative, suggests that any group differences were due mostly to sampling fluctuation and that the groups were comparable demographically.

Table 7.2

Comparability of Groups on Demographic Characteristics for the Belleville Project

	Subjects Included in Posttest Analysis							
	Control Group			Treatment Group				
Variable	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p Value	ES[$]
• Age of child in months as of 7/1/87	25.4	5.4	9	28.7	9.6	11	.54	.61
• Age of mother in years	32.2	5.3	9	32.8	7.6	11	.84	.11
• Age of father in years	33.4	6.9	9	32.9	3.2	9	.84	.07
• Percent male[*]	67.0		9	82.0		11	.46	.28
• Years of education for mother	12.0	2.6	9	13.2	2.6	11	.33	.46
• Years of education for father	12.6	2.6	9	13.6	2.5	9	.42	.38
• Percent with both parents living at home[*]	89.0		9	82		11	.68	-.12
• Percent of children who are Caucasian	100.0		9	91		11	+	.18
• Hours per week mother employed	16.0	19.2	9	8.6	15.5	11	.35	.39
• Hours per week father employed[**]	31.3	19.4	8	26.7	18	9	.62	.24
• Percent of mothers employed as technical/managerial or above[*]	0.0		9	27		11	+	.53
• Percent of fathers employed as technical/managerial or above[*][**]	56.0		9	13		8	.07	-.72
• Total household income[-]	$21,611	$12,046	9	$15,273	$13,504	11	.25	-.54
• Percent of children in day care more than 5 hours per week[*]	0.0		9	18		11	+	.37
• Number of siblings	2.2	1.4	9	1.0	0.9	11	.03	.86
• Percent with English as primary language	100.0		9	100.0		11	+	0

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scores "1," and those not possessing the trait were scored "0."

[-] Income data were categorical and were converted into continuous data by using the midpoint of each interval.

[+] One or both groups had no variance.

[**] Some data unavailable.

[$] Effect sizes (ES) for continuous data were estimated as follows: $ES = \bar{X}_e - \bar{X}_c \div S_c$. Positive ESs were for differences in favor of the intervention group when appropriate (e.g., household income).

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Experimental Interventions

The services provided to the treatment and control groups are described below.

Treatment group. The intervention consisted of twice-weekly home visits in which the Teaching Research Curriculum in combination with the Portage and Carolina curricula were used. Content of each home-based session was based on (a) recommendations made by a multidisciplinary assessment team, which typically included a psychologist, speech/language pathologist, OT/PT, educator, and the child's parent, and (b) the child's progress over time. An Individual Habilitation Plan (IHP) was developed for each child based on this information and was used to guide the intervenor in working with the parent during intervention. A variety of assessment instruments and curricula were used to develop the specific objectives in the IHP.

The home intervenors were trained in a nondirective family-oriented approach. The Belleville project provided inservice training of staff conducted by local professionals and outside experts. The home intervenors kept detailed documentation of each home-based session. Their files included all necessary information, well developed IHPs, and family treatment plans. The home visits were conducted in two weekly sessions with a total duration of approximately 3 to 4 hours per week. Intervention was based on individual needs of the families and the targeted child. The home intervenors provided the necessary information and spent a portion of the visit encouraging the child's parent to express their needs, concerns, and frustrations. In some cases, the intensity of the intervention with the parent was equal to the intensity of the intervention with the child. The treatment philosophy was based on meeting the needs of both the child and the parent(s) within the framework of family systems theory (Haley, 1976).

The intervention with the child was carried out with the parents as involved as possible, by observing and learning. The home intervenors instructed parents in methods, strategies, and knowledge for working with their own child. The direct programming for the children was individualized and based on developmental sequences. Activities were designed and implemented to meet individual goals set in the areas of language/communication, gross/fine motor, cognitive, self-help, and family needs.

The schedule of a home visit included: a warm-up play period; discussion of current concerns and child's status; direct 1:1 programming designed to meet specific objectives; work with the parents; discussion of progress made towards objectives, and data recording. When ending the visit, the teacher reminded the parent of the next visit and of any planned activities. Data sheets, program descriptions, detailed instructions, and materials were left for the parent to use, and the parent was given encouragement and praise. In some cases, the only data recorded by parents was whether or not the activity took place or how well the activity proceeded. For example, in a feeding program, the key data recorded was that the child was successfully positioned or that the child consumed two ounces of food orally.

The intervenors kept detailed data on number of trials, correct response and error rates, and a specific description of what progress took place towards each objective. Their anecdotal records described the session, the parent's and child's response, and plans for the next session. The IHPs were evaluated on a quarterly basis. All goals which had been achieved were recorded on a quarterly summary by the multidisciplinary team. During the site visit by the EIRI coordinator, 10% of the IHPs were randomly sampled and evaluated and found to be age appropriate, developmental, and functional in nature.

The project offered a twice-monthly sharing group and a twice-monthly support group. The sharing group was informational in nature, with parents instructed on different issues related to child development and disabilities. The support group was more informal, with parents discussing their immediate needs and concerns.

Control Group. Children in the control group were pretested and posttested. They received no direct services during the pretest-posttest interval except for any additional services that their parents sought for them outside of the project. The home intervenors placed monthly phone calls to the parents of each child in this group to maintain contact with the family and to ensure their continued participation in the study. Parents were invited to the twice-monthly sharing and support groups described above.

Treatment verification. A number of procedures were used to verify that treatment was being implemented as intended. They included weekly contacts with the site and three site visits to assess the quality of the intervention. The following additional data were collected:

1. ***Collection of attendance data***. The child's participation in the program was recorded according to the length of the session, the staff involved, the number of home visits, and the length of intervention in months. Nonattendance at regularly scheduled sessions was also recorded according to the reason for nonattendance (e.g., child illness, holiday, etc.). Attendance averaged over 80%; all missed sessions were rescheduled for make-up. As presented in Table 7.3, the mean number of home visits was 32.5, with a range of 14 to 50 visits, while the mean length of intervention was 5.5 months, with a mode of 7 months and a range of 3 to 7 months.

Table 7.3

Intensity of Treatment and Additional Services for Posttested Subjects for Belleville Project

	Control Group			Treatment Group			
Variable	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p
Mean number of home visits				32.5	15.1	11	
Mean length of intervention in months				5.5	1.9	11	
% of Subjects Receiving > 10 Hours Additional Treatment Services[§]	33%		9	27%		11	.78

[§] These include speech therapy, physical therapy, and preschool services.

2. ***Annual teacher evaluations.*** Annual teacher evaluations were conducted by the administrative director. Results of the evaluations indicated that the teachers were highly competent, qualified, and performed at a high level of excellence.

3. ***Additional services data.*** Additional services data were collected to assure that there were true differences between groups in services received. While some subjects in each group did receive either additional speech, physical, or preschool services, it can be seen in Table 7.3 that there was no difference in the percent of subjects in each group receiving additional services. Furthermore, the number of hours for those subjects who did receive additional services was generally comparable across groups.

Finally, while formal records were not kept, it was reported by project staff that it was mostly parents of the treatment group who attended the parent support and sharing groups. Thus, this project approached becoming a truly randomized treatment-no treatment study.

Site Visit

Information gathered during the three on-site visits by the EIRI coordinator was used to evaluate the intervention program. This information included observations of home visits, review of subject folders, and observations of training sessions. The project site coordinator completed a Program Verification packet, as did the EIRI site coordinator.

The results of the on-site evaluations indicated that each child had an appropriate and current IHP. Both home intervenors developed detailed lesson plans, with data collection systems that were observed being implemented in the home visits. Family treatment plans that documented family needs, long- and short-range goals, medical problems, and special services that the child or family received were also reviewed. These plans were reviewed quarterly and revised as needed.

The staff were observed providing good modeling for both children and family members. The staff acted as a resource to the families and provided strategies aimed at improving parent-child interactions. Staff provided a great deal of positive reinforcement and especially reinforced small increments in skill development. It was evident that the intervention had been implemented as planned.

Data Collection

Recruitment, training and monitoring of diagnosticians. Two diagnosticians were trained to administer pretest and posttest Battelle Developmental Inventories (BDI). One diagnostician had a master's degree in psychology, the other had a bachelor's degree and experience as a parent-infant educator. Both diagnosticians were "blind" to the child's group assignment and the research design. Ten percent of the BDIs were "shadow scored" by the EIRI site coordinator with interrater reliabilities of 90% obtained.

Pretesting. Parents of each child participating in the study completed an informed consent form and provided demographic information. Children were administered the BDI. Parents completed the following measures: the Parenting Stress Index (PSI), which assesses stress in the parent-child system; the Family Support Scale (FSS), which assesses different sources of support available to families with young children; the Family Resource Scale (FRS), which measures different kinds of resources available to the family; the Family Inventory of Life Events and Changes (FILE), which measures life events and changes experienced by the family during the previous 12 months; and the Family Adaptability and Cohesion Evaluation Scales (FACES III), which assess the separateness or connectedness of the family members to the family. BDI testing occurred at a center which was centrally located to the program. This ensured that the test setting was equally unfamiliar to all subjects. The primary caretaker completed the family measures following the administration of the BDI. The diagnostician completed a testing report and transmitted all data to the EIRI site coordinator.

Posttesting. Posttest BDIs were collected after children had been enrolled in the program (pretest-posttest interval) for a minimum of 9 months and a mean average of 11.

Results and Discussion

Comparability of Groups on Pretest Measures

The pretest data were carefully scored and checked prior to being analyzed. It can be seen in Table 7.4 that, for BDI scores, there were no statistically significant differences between treatment and control groups, although control subjects slightly outperformed treatment subjects on most measures. Among family measures, there were also no statistically significant differences ($p < .10$) between groups on any of the measures. As with the group comparisons on the demographic variables, the scatter of positive and negative effect sizes of various magnitudes on the BDI and family measures suggests that any group differences were mostly due to sampling fluctuation and that the groups were basically comparable on these measures at pretest.

Posttest Measures of Child Functioning

The posttest BDIs were scored and checked prior to data analysis. Mean scores for each of the BDI domains were compared using an analysis of covariance (ANCOVA), which increases the statistical power to detect differences between the sample group means. The pretest BDI total raw score was used as the covariate for all comparisons, accounting for anywhere between 69% and 84% of the variance of the posttest BDI domain scores. However, it can be seen in Table 7.5 that there were no statistically significant differences between the groups on any of the BDI measures. In fact, except for the BDI cognitive domain score, the control group outperformed the treatment group on all mean BDI domain and total scores (adjusted and unadjusted).

Table 7.4

Comparability of Groups on Pretest Measures for the Belleville Project

Variable	Subjects Included in Posttest Analysis						p Value	ES[$]
	Control Group			Treatment Group				
	$\bar{x}$	SD	n	$\bar{x}$	SD	n		
• Age in months at pretest	14.9	5.8	9	16.3	9.2	11	70	24
• Battelle Developmental Inventory (BDI)[*]								
Personal Social	38.4	16.6	9	36.7	19.5	11	84	-.10
Adaptive Behavior	29.3	10.3	9	30.5	17.4	11	86	-.12
Motor	46.8	21.9	9	43.3	30.2	11	78	-.16
Communication	21.1	10.3	9	21.5	11.6	11	93	04
Cognitive	17.7	6.4	9	17.0	9.3	11	86	-.10
TOTAL	153.3	69.5	9	149.1	84.8	11	90	-.07
• Parenting Stress Index (PSI)[#](@)								
Child Related (range 47 to 235)	122.0	20.0	9	107.0	20.0	11	11	75
Other Related (range 54 to 270)	134.0	26.0	9	122.0	33.0	11	42	46
TOTAL (range 101 to 505)	256.0	44.0	9	230.0	49.0	11	23	59
• Family Adaptation and Cohesion Evaluation Scales (FACES)[•][#]								
Adaptation (range 0 to 26)	6.3	3.3	9	3.8	3.3	11	11	76
Cohesion (range 0 to 30)	5.0	3.3	9	5.0	3.1	11	96	0
TOTAL (range 0 to 40)	8.4	3.8	9	6.9	3.4	11	37	39
• Family Resource Scale (FRS)[&][%]	51.0		9	48.0		11	88	-.07
• Family Support Scale (FSS)[&][%]	47.0		9	63.0		11	59	40
• Family Index of Life Events (FILE)[~][#]	11.2	4.7	9	11.5	6.3	11	90	-.06

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desirable.

(@) A low raw score and/or a low percentile score indicates lower stress level.

[•] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best, and positive ESs indicate that the experimental group scored closer to "ideal."

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher percentiles and positive ESs are considered better.

[%] No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children)

[~] A low raw score and/or a high percentile score indicates lower stress level, and a positive effect size is more desirable.

[$] Effect sizes (ES) for continuous data were estimated as follows: $ES = \bar{X}_e - \bar{X}_c \div S_c$. Positive ESs were for differences in favor of the intervention group when appropriate (e.g., household income).

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Table 7.5

Posttest Measures of Child Functioning for the Control-Treatment Groups for Citizens for the Belleville Project

		Control Group				Treatment Group						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[*]
• Age in months at Posttest		25.9	6.4		9	27.3	10.1		11	36	.73	22
• **Battelle Developmental Inventory (BDI)**												
DQs for												
Personal-Social	1	65.0	21.2	64.3	9	65.2	29.9	65.9	11	09	77	08
Adaptive Behavior	1	45.0	10.7	44.6	9	45.2	20.6	45.6	11	05	82	09
Motor	1	74.3	21.6	73.7	9	68.9	29.4	69.5	11	45	51	-.19
Communication	1	35.4	14.5	35.0	9	35.8	19.9	36.3	11	17	69	09
Cognitive	1	26.0	9.9	25.7	9	25.8	12.2	26.1	11	02	88	04
TOTAL	1	242.3	79.3	239.9	9	240.9	107.7	243.4	11	.04	84	04

[*] Effect Size (ES) is defined here as the difference between the groups (Treatment minus Control) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Sizes).

[$] 1 = Battelle Raw Pretest Total Score

Conclusions

The purpose of this study was to evaluate whether a home-based early intervention program for children with disabilities from birth to 29 months would result in positive development changes as measured by a comprehensive developmental measure. Two counties in western Illinois where preschool services for the disabled previously had not existed were targeted for this study. Eligible children were stratified by severity or type of disability and age and randomly assigned to either a home-based intervention group or a no-treatment control group. Subjects and their families were pretested to determine any pretreatment group differences, and the groups were found to be comparable. Treatment verification procedures were used to document that the early program was implemented in an appropriate manner. The intensity and duration of the intervention for the treatment group was comparable to what is delivered in typical practice and stood in contrast to the virtual lack of services received by the control subjects and their parents. There were no statistically significant between-group differences on any of the posttest BDI measures.

This study was not without its flaws. It would have been desirable to have had posttest family measures and additional child measures to assess more broadly any possible treatment effects. In addition, the period of treatment may have been too short to have had a measurable effect. However, the fact remains that randomly assigned subjects demonstrated no treatment effects following a significant period of intervention.

These results are consistent with the Sandow et al. (1981) study and challenge the assumption that the more intensive the intervention, the greater will be the impact. What makes this study more compelling than the Sandow et al. (1981) study is that subjects were randomly assigned to groups, the child assessments were developmental in nature and obtained by "blind" diagnosticians, and the treatment intervention was well documented. These results underscore the arguments made by White and Casto (1985) and their associates that we need to continue to empirically test many of the assumptions on which delivery of early intervention services are based. The best way to do this is often with randomized experimental studies in which the effects of alternative types of interventions are rigorously tested.

REVIEW OF EARLY INTERVENTION WITH MEDICALLY FRAGILE CHILDREN

Approximately 180,000 medically at-risk infants are born annually in the United States. Despite the fact that survival rates for these infants are improving, due in part to improved standards of care in Neonatal Intensive Care Units (NICUs), the mortality rate for low birthweight infants, particularly very low birthweight infants (less than 1000 g), remains high. A substantial percentage of low birthweight (LBW) infants suffer a permanent disability (Danto, 1984), and infants who have spent considerable time in NICUs make up a disproportionately large segment of the population with disabilities, with estimates ranging as high as 60%.

The conditions that predispose an infant to be medically at risk are well known, but an operational definition for what constitutes a medically at-risk infant is difficult to state. As Bennett (1987) points out, there has been a tendency to use the terms "handicapped" and "high risk" almost interchangeably.

> *Thus, the 'high risk' label must always be applied cautiously with the understanding that for the majority of biologic insults, most survivors will not develop the developmental complications for which they have increased epidemiological risk (Scott & Masi, 1979). As a corollary to this important distinction, many instances of severe developmental disabilities are idiopathically encountered with no apparent biological risk. These facts emphasize the need to differentiate precisely risk and disability, both clinically and for research purposes, to avoid carelessly inferring one from the other or using the terms interchangeably.*

RISKS ASSOCIATED WITH EARLY MEDICAL COMPLICATIONS

Traditionally, low birthweight infants (LBW) (less than 2500 g) have been seen as being medically at-risk. It has been suggested by Bennett (1987) that the low birthweight infant may be the prototype for understanding the development of most biologically at-risk infants, including those with periventricular-intraventricular hemorrhage, bronchopulmonary dysplasia, intrauterine growth retardation, perinatal asphyxia, central nervous system trauma (accidents, abuse, ingestion of toxics), substantial hypoxia, etc. This statement is made because survival rates for low birthweight infants bear a direct relationship to their birthweights, these infants are particularly vulnerable to the conditions described above, and many of these infants incur more than one of the above conditions. In fact, a distinguishing characteristic of low birthweight infants is that, unlike full-term infants, they have a propensity to develop serious medical complications (Sostek, Smith, Katz, & Grant, 1987).

Following this line of reasoning, one might suggest that an even better prototype for the study of biologically at-risk infants is the very low birthweight infant (less than 1000 g). Consider the dramatic difference in mortality rates and neurodevelopmental morbidity between infants weighing less than 1000 g and those weighing 1000 g or more. The difference in mortality rates is illustrated below using data from Bennett (1987).

Birthweight	Survival %
Less than 1000 g	30%
1000 g to 2500 g	86%

Neurodevelopmental morbidity rates are also consistently higher for the very low birthweight infant (VLBW) (Klein, Hack, Gallagher, & Faneroff, 1985). Very low birthweight infants experience significantly more neurodevelopmental and behavioral sequelae than low birthweight infants, who, in turn, exhibit more than normal birthweight infants.

Follow-up research studies with medically at-risk infants have tended to focus on low birthweight infants as opposed to very low birthweight infants and those infants with the types of medical complications described above. In this context, both short- and long-term follow-up of low birthweight infants have been conducted. Generally, short-term follow-ups have found that low birthweight infants experience early developmental abnormalities which may disappear over time (Drillien, 1972). That is, the severity of neonatal illness itself is not a good predictor of later developmental outcome. Following infants with an identified condition (intraventricular hemorrhage [IVH]), Sostek et al. (1987) determined that severity of IVH was related to Bayley mental and motor scores at one year of age but not at two. Goodwin et al. (1987) found that severity of IVH was not related to outcome at ages 5 and 6, but both mild and severe groups lagged behind their age mates in terms of developmental outcomes. These studies demonstrate that more complex risk formulations using complications such as IVH, bronchopulmonary dysplasia, etc., still constitute limited models of prediction. This finding was confirmed by Casto et al. (1987), who found very low birthweight alone to be a better predictor of outcome than specific medical sequelae, including the presence of IVH or bronchopulmonary dysplasia.

An increasing number of studies have followed low birthweight infants into the school years. For the very low birthweight infants below 1000 g, a study by Nickel, Bennett, and Lamson (1982) found that 65% of VLBW survivors were experiencing fairly severe school problems. Ralston (1985) located the records of 22 very low birthweight infants who had received services in newborn follow-up clinics. Fourteen of the 22 children (64%) followed had significant neurodevelopmental disabilities. Several of the 14 children had more than one major disability. Thus, the very low birthweight infant is not only prey to major disabilities as an infant, he/she is also victimized by later learning problems. This finding underscores the importance of early intervention as well as continuous follow-up of this population.

ALTERNATIVE APPROACHES TO INTERVENTION WITH LOW BIRTHWEIGHT INFANTS

Faced with a high-risk population, researchers and practitioners have designed and implemented many different types of intervention programs beginning in the NICU or shortly after. NICU-based interventions have been based on varying theoretical perspectives as well as diverse interpretations of the NICU environment. Bennett (1987) has addressed this issues as follows:

> *Does this unusual medical setting constitute a source of (1) sensory deprivation, requiring a variety of added stimulations; (2) constant over-*

> *stimulation, requiring* ***less*** *handling and* ***less*** *intervention of all types and more time for uninterrupted sleep; or (3) an inappropriate* ***pattern*** *of interactions rather than simply too much or too little stimulation and including aspects of both deprivation and over-stimulation? (p. 88)*

Intervention studies have been reported in the research literature which are based on each of these positions. For example, Rosenfield (1980) reported a study which was based on the first interpretation. In this study, tactile and vestibular-kinesthetic stimulation activities were provided in the NICU for two 20-minute periods daily. This study included 29 infants (15 experimental group infants and 14 non-treatment controls). The experimental group attained higher "state" rating system scores, and experimental group mothers visited significantly more often.

A recent study by Als et al. (1986) provides an example of intervention research based on the second interpretation. This study focused specifically on very low birthweight infants with bronchopulmonary dysplasia, and tested the hypothesis that the functional states of the very low birthweight infant could be altered by preventing inappropriate sensory input in the NICU. The study produced statistically significant results which favored the experimental group.

Representative of studies taking the third perspective is research by Thoman (1987), who hypothesized that the premature infant would be able to learn to control the level of stimulation received in the NICU and to self-select the appropriate amount of stimulation. Two groups of premature infants 32 to 34 weeks conceptional age were given the opportunity to self-regulate contact with a breathing bear (Group 1) or a non-breathing bear (Group 2). A third group of infants had no bear in their isolette, but were observed to control for movement to the area the bear would occupy. The breathing bear, a small teddy bear with a breathing apparatus implanted, was set to breathe at one-half of the rate of the individual infant it was with. This rate was determined during a period of quiet sleep. All infants were continuously monitored using time-lapse video recording. After less than three weeks' exposure to this stimulation, the infants in Group 1 spent far more time in contact with the breathing bear than infants in either of the other two groups.

Furthermore, the infants exposed to the breathing bear showed significantly more quiet sleep than the infants in either of the other groups. The three groups did not differ on either of these measures during the first three days of the intervention.

CONCLUSIONS OF PREVIOUS REVIEWERS

Varying definitions of what constitutes a medically at-risk child and perspectives of NICU environments have influenced intervention programs greatly and have had a direct bearing on questions about the efficacy of early intervention programs for such children. To understand the context for studies done with medically fragile children as a part of the **Longitudinal Studies**, it is important to consider briefly the conclusions of previous reviewers in this area.

At least 12 previous reviews have assessed the effectiveness of infant stimulation programs for low birthweight infants. The previous reviews examined an average of 14 primary research studies (range = 8 to 29). Previous reviews almost uniformly concluded that early intervention programs for low birthweight infants are effective, although one review (Cornell & Gottfried, 1976) concluded that effectiveness had only been demonstrated in the motor area. Other reviewers reported effectiveness over the dimensions of improved cognitive functioning, weight gain, visual alertness, sleep patterns, and fewer apneic periods. Most reviewers concluded that only short-term gains had been documented and articulated a need for longer-term follow-up. The most comprehensive review was done by Casto et al. (1987) in which 29 studies were reviewed using meta-analysis techniques. Casto et al. concluded that across all intervention conditions, infant stimulation programs produced gains that averaged ½ of a standard deviation, although there are several qualifications.

AN ANALYSIS OF PRIMARY RESEARCH STUDIES

Staff of the Early Intervention Research Institute (EIRI) at Utah State University have been able to identify and analyze 47 studies which have investigated the effects of early intervention with medically fragile infants. Studies were located by a combination of the following procedures. A detailed search of computerized data bases including, *Index Medicus*, *ERIC*, *Psychological Abstracts*, *Dissertation Abstracts*, and *SSIE Current Research* was done. Also, letters were written to prominent early intervention researchers and service providers requesting their assistance in the identification of efficacy research which might not be reported in the professional literature. Previous reviews of the early intervention literature were also examined for reports of efficacy research, and efficacy reports referenced in studies already obtained were identified. Studies were included if the study dealt with low birthweight infants (under 2000 g) and tested some type of non-surgical intervention.

A coding system was developed to analyze the outcomes and characteristics of each study identified. Based largely on an analysis of previous reviews of early intervention efficacy literature (White et al., 1985-86), variables in each of the following areas were coded for each study:

1. ***A description of the subjects*** included in the research (20 items including demographic variables on both infant and family).
2. The mode of ***intervention*** used (37 items including mode of intervention, the setting, child-intervenor ratio, etc.).
3. The type and quality of ***research design*** employed including presence of various threats to validity and whether data collectors were "blind" (17 items).
4. The type of ***outcome*** measured and the procedures used (12 items).
5. The ***conclusions*** reached by the study including the magnitude of the standardized mean difference effect size, the source of that information, and the conclusions of the author(s) (7 items).

For each of the items coded for each study, conventions or definitions were written. For example, mode of intervention was coded according to the following guidelines:

1 = ***Medical*** - any drug or therapeutic intervention designed specifically to ameliorate or facilitate the physical health, function, or well being of the child except for interventions coded as "4" below. Include in this category occupational therapy or physical therapy programs.

2 = ***Setting Change*** - the movement of the child from one milieu to another, or a substantial change of the child's milieu without an accompanying education, medical, or therapeutic intervention.

3 = ***Stimulation*** - the deliberate exaggeration (amount or frequency) of sensory stimuli or stimuli to other (physical modalities) such as the vestibular system.

4 = ***Diet*** - a deliberate adjustment of food intake in order to ameliorate or facilitate a physical or nonphysical condition.

5 = ***Other*** - therapies which cannot be classified in the categories above should be coded in this category and a specific note made describing the type of therapy.

The magnitude of the effect attributed to each intervention was estimated using a standard mean difference effect size, defined as $(\bar{X}_E - \bar{X}_C) \div SD$ (Glass, McGaw, & Smith, 1981). This "effect size" measure is essentially the difference between experimental and control groups measured in Z score units and has been widely used in recent years to describe the impact of educational programs (Cohen, 1977; Glass, 1976; 1978; Horst, Tallmadge, & Wood, 1975; Tallmadge, 1977). In cases where there was no control group and pre-post designs were used, the standardized mean difference effect size was defined as $(\bar{X}_{posttest} - \bar{X}_{pretest}) \div SD$ (Glass et al., 1981). In other words, when no control group was utilized, pretest scores provided the best estimate of how subjects would have performed had they not received the treatment.

Because multiple raters were involved in the study, interrater consistency checks were done for a sample of the studies coded (87% average agreement). Also, all Effect Size (ES) computations were independently checked, and a sample of keypunched data was checked against the original coding. More extensive explanation of the procedures utilized are available in Casto et al. (1983).

Information about several key variables for each of the 47 studies is included in Table 1. The effect sizes included in the analysis came from studies conducted from 1964 to 1988, most since 1970. These studies were reported mostly in medical and psychological journals; but some came from educational journals, books, ERIC documents, government reports, and dissertations. Not surprisingly, the most frequently measured outcome was some type of health measure, usually weight gain. Other infant change measures included motor, IQ, social-emotional, and behavioral measures such as amount of quiet sleep, amount of eye contact, etc. Various types of mother/infant interaction measures were also included.

The nature of the intervention as reported in Table 1 was identified based primarily on Bennett's (1987) classification of interventions delivered to medically fragile infants as being auditory stimulation, tactile stimulation, vestibular-kinesthetic stimulation, auditory and vestibular-kinesthetic stimulation, tactile and vestibular-kinesthetic stimulation, and multi-modal sensory stimulation. In the studies listed in Table 1, 15 used some type of tactile-kinesthetic intervention, 3 used auditory stimulation, 8 used waterbeds, and 7 trained mothers to deliver some type of stimulation or intervention. Only one study attempted environmental manipulations. The duration of the interventions ranged from one week (Edelman, Kraemer, Korner, 1982) to 62 weeks (Ross, 1984).

The average effect size across all studies was .46; although the overall results suggest that infant stimulation programs produce modest short-term effects. There are some disconcerting inconsistencies. For example, if one considers only the developmental outcomes of the 26 studies judged to be of good quality, the effect sizes range from -.30 to 1.79. Furthermore, some of those interventions which are the most intense or of longest duration find some of the smallest effects. Consequently, definitive conclusions as to the effects of early intervention with medically fragile infants are still elusive and more research is urgently needed.

Table 1

CHARACTERISTICS OF EARLY INTERVENTION STUDIES WITH MEDICALLY AT-RISK CHILDREN

					NATURE OF INTERVENTION											
Author/Year	#ES	Quality	Design	Total n	Hospital	Home	Center	Hrs. Per Week	Weeks Duration	Total Hours	Neurological Impairment	Longitudinal Data Taken	Developmental Measures	ES	Other Measures	ES
Barrera et al. (1986)	6	Good	2 Experimental vs Control	59	—	Developmental Programming	—		52	—	N	N	Bayley	.39	—	—
Burns et al. (1983)	2	Good	Experimental vs Control	22	Rocking Waterbed & Auditory Stim	—	—	168	4	672	N	N	BNBAS	.42	Health Status	.15
Edelman et al. (1982)	1	Good	Crossover Experimental vs Control	12	Waterbed		—	168	1	192	N	N	—	—	Sleep	.58
Field et al. (1986)	2	Good	Experimental vs Control	40	Tactile & Kinesthetic Stimulation			4	2	8	N	N	BNBAS	1.15	Weight	.53
Freeman (1969)	6	Good	2 Experimental vs Control	39	Handling			14	1	20	N	N			Physical Measurement	.13
Field et al. (1982)	2	Good	Experimental vs Control	57	Pacifier During Tube Feedings	—			4	—	N	N	BNBAS	.39	Weight	.51
Goodman et al. (1985)	1	Good	Experimental vs Control	40	Infant Stimulation				39	—	N	N	Griffeths	.06		—
Hasselmeyer (1964)	6	Good	Experimental vs Control	40	Tactile, Sensory, & Kinesthetic Stim			24	2	47	N	N	—		Health, Weight, Crying, Movement	.08
Helders et al. (1989)	2	Good	Experimental vs Control	48	Stimulation				8	—	N	Y	Carey	.87	Height, weight	—
Kattwinkel et al. (1975)	2	Good	2 Groups—Pre Post	18	Tactile & Oxygen	—	—	1	1	1	N	N		—	Frequency of APNEA	1.01
Katz (1971)	3	Good	Experimental vs Control	62	Auditory Stim			4	6	21	N	N	Rosenblith	1.79	Rosenblith	1.11
Korner et al. (1975)	1	Good	Experimental vs Control	21	Waterbed			120	1	120	N	N	—		Health	.46
Korner et al. (1978)	1	Good	Experimental vs Control	8	Waterbed			12	1	12	N	N	—		Frequency of APNEA	.44
Korner et al. (1982)	2	Good	Experimental vs Control	17	Waterbed			96	1	96	N	N	—		Sleep, APNEA	.47
Kramer & Pierpont (1976)	1	Good	Experimental vs Control	20	Waterbed, Tactile, Auditory			—	4	—	N	N	—		Weight, head circumference	1.48
McNichol (1974)	12	Good	3 Experimental vs Control	30	Visual Stim., Tactile Stim			7	2	14	N	N	—	—	Weight gain, Visual atten.	.53
Minde et al. (1980)	2	Good	Experimental vs Control	57	Discussion groups			—	21	—	N	N	—		Maternal attitude Length of feeding	1.22
Nurcombe et al. (1984)	4	Good	Experimental vs Control	74	Training of mother		—				N	N	Bayley, Carey	.30	Maternal Adj.	.45
Rausch (1981)	3	Good	Experimental vs Control	40	Tactile & kinesthetic stimulation			2	1	3	N	N	—		Health	.81
Resnick et al. (1987)	4	Good	Experimental vs Control	221	Stimulation	Home visits		—	52		N	Y	Bayley	.39	—	—
Rice (1977)	1	Good	Experimental vs Control	29		Stim. taught to mothers		7	4	30	N	N	—		Weight, length, head circum.	.23
Rose et al. (1980)	1	Good	Experimental vs Control	60	Tactile stim			5	3	13	N	N			Physical measure	.20
Scott & Richards (1979)	1	Good	Crossover Experimental vs Control	6	Lambs wool			84	2	144	N	N			Weight gain	.52
Segall (1972)	2	Good	Experimental vs Control	60	Auditory stim		—	3	6	15	N	N	—		Cardiac response	.35
White & Labarba (1976)	1	Good	Experimental vs Control	12	Kinesthetic stim	—		7	1	10	N	N	—		Weight gain	1.77
Zeskind & Iacino (1984)	1	Good	Experimental vs Control	26	Train mother	—	—	—	—	—	N	N	—		Weight Gain	.09

(continued)

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Table 1 (continued)

CHARACTERISTICS OF EARLY INTERVENTION STUDIES WITH MEDICALLY AT-RISK CHILDREN (continued)

Author/Year	#ES	Quality	Design	Total n	NATURE OF INTERVENTION Hospital	Home	Center	Hrs. Per Week	Weeks Duration	Total Hours	Neurological Impairment	Longitudinal Data Taken	Developmental Measures	ES	Other Measures	ES
Als et al. (1986)	3	Fair	Experimental vs Control	16	Environmental Care	—	—		12	—	Y	Y	Bayley	1.33	NICU, Health	93
Barnard (1982)	27	Fair	3 Groups A vs B	185	Individualized and general nursing	Home visits to assess child health	—		13	—	N	Y	Bayley	01	Variety	04
Barnard (1981)	6	Fair	Experimental vs Control	15	Rocking Waterbed & Heart Beat	—			3	—	N	Y	Bayley	31	Home, Health	10
Brandt (1980)	1	Fair	Experimental vs Control	34	—	Vojta Stim			—		Y	N		—	Health	64
Bromwich & Parmelee (1979)	3	Fair	Experimental vs Control	63		Home-Based Education intervention			61	—	N	N	Bayley	06	Home	60
Field et al. (1980)	4	Fair	Experimental vs Control	57		Train mothers on child rearing	—	3	17	54	N	N	Bayley	40	Growth, State	54
Field (1982)	6	Fair	2 Experimental vs Control	60		Stimulation	Nursery	Center 40	—	—	N	N	Bayley	64	—	
Kramer et al. (1975)	1	Fair	Experimental vs Control	14	Tactile Stim	—		6	2	11	N	N			Weight gain	47
Leib et al. (1980)	5	Fair	Experimental vs Control	28	Stimulation				2	—	N	Y	Bayley, NBAS	65	Weight gain, Length, head circumference	06
Powell (1974)	9	Fair	Experimental vs Control	28	Handling	—	—		—	—	N	Y	Bayley	46	Bayley infant behavior	56
Raugh et al. (1988	7	Fair	Experimental vs Control	53	Training mothers general stim.	To implement program		1	14	11	N	Y	Bayley, McCarthy	50	Self confidence Role satisfaction Infant temper	81
Rosenfield (1980)	1	Fair	Experimental vs Control	78	Kinesthetic stim	—	—	5	7	34	N	N	—		# of visits by mothers, restfulness	85
Ross (1984)	3	Fair	Experimental vs Control	80		Teach mothers	—	—	62	—	N	N	Bayley	44	Home	88
Schwartz (1978)	2	Fair	Experimental vs Control	21	Social Stim	—	—		—		N	N	NBAS	67	Home	1.70
Williams & Scarr (1971)	6	Fair	2 Experimental vs Control	46		Train mothers	—		17	—	N	N	PPVT	50	ITPA	90
Barnard (1973)	4	Poor	Experimental vs Control	15	Rocking Waterbed & Heart Beat	—	—		4	—	N	Y	Bayley	87	Sleep, Weight	1.15
Field (1982)	2	Poor	Experimental vs Control	60	—	Stimulation & Education	—	—	22		N	Y	Bayley	41		
Garrett (1981)	3	Poor	Pre-Post	10		—	Infant Stim		47		N	N	Bayley, ELAP	34	—	—
Korner et al. (1983)	1	Poor	Experimental vs Control	20	Waterbed	—	—	168	5	840	N	N	—		LAPPI (health)	1.17
Maisto & German (1979)	8	Poor	Pre-Post	32		—	Parents trained in stim. programs	—	52	—	N	Y	Bayley, REEL, Bzoch	65	—	
Scarr Salaptek & Williams (1973)	1	Poor	A vs B	23	Stimulation	Stimulation	—	28	52	—	N	N	Catell	60	—	

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Contributing to the need for further research is the fact that most existing high-quality studies excluded medically at-risk infants who had neurological impairments or serious medical complications. Thus, conclusions about early intervention effects for this population have been drawn largely from studies with low birthweight, but intact, infants.

Five recent studies have included low birthweight infants with medical complications. For example, Als et al. (1986) studied 16 low birthweight infants with bronchopulmonary dysplasia. Experimental group infants received a program designed to reduce excessive NICU stimulation, while control group infants received the regular NICU regimen. Experimental group infants performed significantly higher on the Bayley scales at 9 months, but no longer-term follow-up data is available. Helders (1989) designed a similar stimulation program for very low birthweight infants under 1500 g who had no medical complications. He followed very closely the intervention program of Als et al. (1986). He found short-term effects of the same magnitude as Als et al., but when he collected longer-term follow-up data, he concluded that the intervention program actually had a deleterious effect on the experimental group. His study underscores the importance of collecting longitudinal data over a longer period of time. Resnick, Armstrong, and Carter (1988) studied 221 infants with birthweight lower than 1800 g. The 107 infants in the treatment group received developmental interventions in the nursery, followed by home visits until the infants reached 12 months adjusted age. Experimental group infants performed significantly higher on the Bayley Mental Scale and the Greenspan-Lieberman Observation System (GLOS). At two-year follow-up, 19 experimental group infants and 22 control group infants were assessed, and the experimental group retained its advantages.

These studies provide an important context for the three studies being conducted by Early Intervention Research Institute as summarized later in this report. These studies are randomized trials with low birthweight infants suffering from intraventricular hemorrhage, bronchopulmonary dysplasia, or having birthweights below 1000 g. The fact that infants in the control group are performing as well as experimental group infants at 24 and 30 months is puzzling when these results are compared to the Als et al. (1986) and the Resnick et al. (1987) findings. It clearly becomes important to replicate the studies with much larger samples before definitive conclusions are drawn.

CONCLUSIONS

In summary, of the five recent studies which have included infants with medical or neurological sequelae, three studies found no significant differences, while two studies, one with small sample sizes (Als et al., 1986), and one with large sample sizes (Resnick et al., 1987), found significant differences. If the two studies which found differences can be replicated successfully, they represent low cost, easily replicated, interventions which deserve more widespread use. Until such time as replication occurs, however, it might be wise to withhold final judgment as to the efficacy of early intervention programs for medically at-risk infants. This is particularly important in the absence of longitudinal data of the type reported by Helders (1988).

In the remainder of this section, the results of four studies are presented which were done with medically fragile children. The first three are age-at-start comparisons. It is important to remember, however, that until the delayed intervention began, they are really measuring the effects of intervention versus no intervention.

CHARLESTON, SOUTH CAROLINA IVH PROJECT

Project #8

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age versus services at 12 months.

LOCAL CONTACT PERSON: Conway Saylor, Ph.D.; Medical University of South Carolina

EIRI COORDINATOR: Lee Huntington, Ph.D.

LOCATION: Charleston, South Carolina

DATE OF REPORT: 4-10-1991

Rationale for the Study

One of the primary contributors to infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).

Forty percent of low birthweight infants (or approximately 90,000 infants per year) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade

I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile et al., 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is limited and controversial (Hynd et al., 1984). Williamson et al. (1982) found that 29% of Grade I and II IVH LBW infants exhibited moderate disabilities by the age of 3, whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities, such as cerebral palsy, by the third year of life. Sostek et al. (1987) concluded that the severity of IVH did not predict the infant's developmental progress at 2 years of age; however 40% of the infants in that study showed significant delays at 2 years. Finally, Bozynski et al. (1984) indicated that these infants are at especially high risk for later motor problems.

Although there is a fair amount of research on interventions for premature low-birthweight babies (see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention; virtually all have excluded children who have suffered major neurological insults such as IVH.

Two recent studies examined the effectiveness of early sensory motor therapy for infants at-risk for developmental delays. Goodman et al. (1985) divided infants into high and low risk for motor problems based on an early assessment, and alternately assigned them to control and intervention groups. A program of weekly home visits began for the intervention group at three months of age. The results of this study indicated that the intervention group did not benefit from the intensive intervention. One methodological flaw with this study that was not clearly discussed in the report was the fact that infants in the control group who started to develop motor problems were removed from the control group and given intervention. This protocol might have resulted in those infants who could have demonstrated the efficacy of the intervention being removed from the analyses.

Palmer et al. (1988) randomly assigned 48 infants with mild and severe spastic diplegia to groups receiving either 12 months of physical therapy or 6 months of infant stimulation followed by 6 months of physical therapy. After 6 months of therapy, the infants in the physical therapy group had lower mean motor scores and were less likely to walk. These differences persisted after 12 months of therapy. In addition, there were no significant differences in the number of infants with contractures or needing bracing, and the physical therapy group had lower mental development scores. The major difference between this study and the current study is the enrollment of children who already show motor problems, rather than those at risk for development of these problems.

Overview of Study

As noted earlier, intervention programs for low-birthweight infants have generally focused on in-hospital stimulation or parent training intervention, and most have excluded children who have suffered major neurological insults such as IVH (for reviews see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984). At issue for this study are the effects and related costs of beginning intervention at different ages for infants who have serious medical problems and who routinely spend up to three months in intensive care units.

The specific comparison for this study was between infants receiving intensive motor-development oriented intervention beginning at 3 months corrected age and infants who began receiving comprehensive developmental services at 12 months of age. This comparison was chosen because a high proportion of the developmental problems encountered by these infants are motor development related. Since these infants routinely receive only medical follow-up until a particular problem or delay is noted, this study provided a good opportunity to test the age-at-start hypothesis.

Methods

This study was implemented in collaboration with the Departments of Pediatrics and Psychiatry of the Medical University of South Carolina in Charleston, South Carolina. The full-time staff of this intervention project consisted of a home interventionist and two physical therapists. The project was overseen on a part-time basis by a director and supported on a part-time basis by a coordinator, a diagnostician, and a secretary.

Subjects

The sample was composed of 64 infants recruited from both urban and rural areas around Charleston. Subject recruitment was closed in October, 1988. All 64 infants have received a pretest and a one-year posttest, 58 infants have had their two-year posttest, and 36 infants their three-year posttest.

Recruitment. Infants qualified for participation in the research if they had been patients in the NICU at the Medical University of South Carolina, if they had experienced intraventricular hemorrhage (IVH) or had a birthweight of less than 1000 g, and if they resided in the catchment area for treatment (60-mile radius). For purposes of assignment, severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH) categories.

Parents of eligible infants were contacted while the infant was still in the NICU, and subsequent telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions, depending upon where they were placed by random assignment. Infants with IVH were randomly assigned to treatment or control conditions by a roll of a four-sided die after stratification by severity of IVH (mild, Grade I or II, or Grade III or IV, severe) and birthweight (under 1000 g or over 1000 g). Those infants who had birthweights under 1000 g, but did not have IVH, were randomly assigned to treatment or control in a 5th cell.

The only people at the site who knew the actual order of eligibility and enrollment of subjects were the site coordinators. The dates on which infants were born were the basis for sequence of enrollment, and infants were assigned to experimental conditions in order of eligibility.

A total of 74 subjects were originally enrolled in this project. Of these, two infants died and did not participate in the study; four infants (5%) moved to areas inaccessible to the project; and four (5%) disappeared, giving the project no notice or address. Thus, 90% of the infants enrolled were still in the program as of July 1, 1990.

Demographic Characteristics. Children were enrolled in this study in two cohorts. The first 19 children were enrolled before the full battery of pretest measures was finalized. Therefore, the pretest for these children consisted only of the Battelle Developmental Inventory (BDI). The next 45 children were enrolled after the full testing battery (described below) had been developed. Forty-five (70%) of the infants who reached the first posttest received the full assessment battery at pretest.

Table 10.1 represents the available demographic data for these infants. All of the children were from families who resided in the metropolitan area of Charleston, South Carolina. The ethnic background of the sample was approximately 65% Black and 35% Caucasian. All of the participants live in homes where English was the primary language, and there were slightly more two parent than single parent families (57% vs 43%). Forty percent of the enrolled families were receiving public assistance. Only one variable differed significantly between the early and delayed intervention groups. There was a higher proportion of males in the delayed intervention group than in the early intervention group (68% versus 30%, respectively).

Table 10.2 displays the medical demographic data of the early and delayed intervention groups. There were no statistically significant differences between the groups in either the overall sample or those infants used for the first posttest analyses.

Alternative Intervention Programs

The comparison for this study was of an early versus delayed intervention program. Intervention occurred in two phases. During Phase I, the subjects assigned to the early intervention group received a sensorimotor intervention beginning when the infants were 3 months of age, and the delayed intervention group received the routine medical follow-up services available to the community in general. In Phase II, the delayed intervention phase, all infants received home intervention services and sensorimotor services as needed. Before the implementation of this project, all infants who were in Neonatal Intensive Care Units were referred to the South Carolina

Table 10.1

South Carolina Medically Fragile Study: Infant Demographics

	Groups							
	Delayed Intervention			Early Intervention				
Variable	X̄	(SD)	N	X̄	(SD)	N	p Value	ES♣
• Age of child in months as of 7/1/90	30	(12)	30	27	(11)	34	.27	-.25
• Age of mother in years	29	(8)	30	28	(6)	34	.40	|.12|
• Age of father in years	31	(7)	29	31	(6)	31	.87	0
• Percent male*	30		30	68		34	.002	|.82|
• Years of education for mother	13	(2)	28	12	(2)	34	.30	-.5
• Years of education for father	13	(2)	26	12	(2)	31	.60	
• Percent with both parents* living at home	55		29	58		34	.78	.05
• Percent of children who* are Caucasian	33		30	36		34	.87	.06
• Hours per week mother employed	16	(19)	29	16	(18)	34	.84	| 0 |
• Hours per week father employed	40	(11)	27	39	(17)	26	.90	|.09|
• Percent of mothers* employed as technical managerial of above	10		29	6		34	.53	-.13
• Percent of fathers* employed as technical managerial of above	14		28	4		27	.18	-.27
• Total household income	$18,125	($19,650)	28	$14,661	($11,885)	34	.41	-.18
• Percent receiving public* assistance	43		28	44		34	.92	-.04
• Percent with mother as* primary caregiver	86		29	94		34	.31	.23
• Percent of children in* daycare more than 5 hours per week	.41		29	.23		34	.14	|.36|
• Number of siblings	1.3	(1.7)	29	1.1	(1.3)	34	.63	|.12|
• Percent with English* as primary language	100			100			1.0	0.0

♣ Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored as "0."

Table 10.2

South Carolina Medically Fragile Study: Comparability of Groups on Medical Characteristics

	Subjects Included in First Posttest Analyses (N = 56)							
	Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	p Value	ES
• Birthweight (gms)	1160	(363)	30	1102	(363)	34	.53	-.16
• Grade of IVH (% with Grade III or IV)	48		30	62		34	.27	-.27
• Very Low Birthweight (% VLBW, no IVH)	14		30	12		34	.81	.05
• Gestational Age (Weeks)	30	(2.7)	30	29	(2.6)	34	.12	-.37
• Days on Ventilator	16	(24)	30	19	(19)	34	.62	-.13
• Apnea (%)	43		30	53		34	.45	-.20
• Seizures (%)	7		30	15		34	.30	-.32
• Respiratory Distress Syndrome (%)	67		30	82		34	.15	-.32
• Bronchopulmonary Dysplasia (%)	33		30	35		34	.87	-.04
• Retinopathy of Prematurity (%)	33		30	53		34	.12	-.42

State Department of Health Neonatal Follow-up Clinic and received routine medical follow-up from private physicians or clinics. Previous funding for these services was provided by the South Carolina Department of Health, for those utilizing the follow-up service; or by patient self-pay, for those using private physicians or clinics. These services remain the standard level of care for all infants in the treatment area. Infants who were assigned to the control group for this project typically received no other services during the first phase of the study, as very few services were available. However, parents were able to access services in the community if they desired. Parents were queried about services they have accessed during the time period of the study, and these results are summarized next.

During both the early and delayed phases of the intervention project, the types of intervention services received were based on the Curriculum and Monitoring System (CAMS) (Casto, 1979). The Curriculum and Monitoring Systems (CAMS) is an early intervention curriculum system designed to meet the educational needs of young children with handicaps served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the curriculum programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or an institutional/school setting.

The CAMS is designed to stimulate optimal development by programs in five areas: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development. The delayed intervention offers the other four domains of the CAMS in addition to the motor domain that was offered during the early intervention.

The ***Receptive Language Program*** teaches the student skills that do not require him to talk but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills to both normal and developmentally delayed children. The program, which is sequenced developmentally, begins with teaching a child to respond to a person and proceeds through teaching him to handle frustration and exhibit self-control.

Early Intervention Program

Between 3 and 12 months corrected age, subjects in the early intervention group were scheduled for twice-monthly one-hour sessions with the physical therapist. The therapist worked with the infant and parents using the Motor Program of the CAMS (Casto, 1979). First, a placement test was administered in the motor skills domain to determine which objectives should be offered to the child. Second, curriculum books were provided with developmentally sequenced objectives and activities for assisting in a child's gross and fine motor development for ages birth to 5 years of age. Each child's program was individualized.

A typical intervention session was conducted by a therapist who worked with the child, with the parent present. The physical therapist also instructed the parent on exercises that the child could do at home, and the parent practiced and demonstrated competence on the exercises before beginning home intervention. The parents were requested to work with the child at home for at least 20 minutes per day, 5 days per week, on techniques they learned in the intervention sessions. The physical therapist telephoned the parent on weeks they did not meet to answer questions and provide guidance on implementation of intervention techniques.

Attendance and progress were monitored on an ongoing basis by the physical therapist's progress notes, and the motor program placement test checklist were updated as goals were met.

Delayed Intervention Program

At 12 months corrected age, all subjects in the early and delayed intervention groups began expanded intervention programs utilizing all five domains of the CAMS programs. A child development specialist administered the CAMS placement tests, determined developmental levels, and set appropriate goals for intervention in each domain. All subjects were given placement tests in motor, social-emotional, self-help, receptive language, and expressive language domains and then participated in an expanded intervention program, which included weekly contacts with an infant specialist. The interventionist alternated twice monthly home visits with telephone contacts and encouraged parents to attend monthly center based sessions for parent-infant dyads.

A child development specialist was scheduled to meet with parent and child for one-hour twice each month and provided intervention. For each session, an objective was determined for the child, the child development specialist modeled the training for the parent, and the parent demonstrated the technique. The parent was asked to spend 20 minutes each day, 5 days each week providing similar intervention with their child at home. The child development specialist called the parent via telephone weekly between home visits to check on progress and answer questions. When the child was seen for the next session, the child development specialist had the parent elicit the new behavior from the child. If the child demonstrated competence in that area, a new objective was chosen and modeled for the parent.

For example, the objective for a child might be to point out facial features. The specialist would teach the parent an exercise to teach the child facial features. At the next meeting, the specialist would have the child point out facial features.

If the child showed competence in that area, a new objective would be established. Depending on their needs, some children would have objectives in several domains, others in only one. Recommendations were also provided to parents regarding problems or concerns such as toileting, feeding, or misbehavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was referred to a physical therapist for motor intervention through the usual community or MUSC-based programs. Those children in the early intervention group who still required motor services either continued meeting with the physical therapist or was referred on as above. If a child who received motor services in the early intervention group no longer required those services, those services were discontinued and home intervention was delivered based on the needs of the child.

Treatment verification. White et al. (1987) discussed two important issues in verifying that an early intervention program occurred as it was intended. First, delivery of intervention must be examined to ascertain that the program which is being delivered is the same as that which was described in the methodology of the proposal and reports. Second, the extent to which infants and their parents received and participated in the program must be examined. The SC-IVH project implemented several procedures to verify that the intervention was implemented as intended.

The first treatment verification procedure was a formal site review, conducted annually. The SC-IVH site reviews were conducted on September 20-21, 1987, April 25, 1988, and June 1, 1989. The purpose of the site review was to collect information regarding the nature and quality of the early intervention services delivered at this site. Documentation of treatment implementation occurred to ascertain that the intervention services were provided as intended and that the project remained faithful to the research protocol. The site review was conducted according to procedures described in the Guide for Site Reviews of EIRI Research

Sites, in the Treatment Verification Handbook for Research Sites (EIRI, 1987). The site was rated excellent on all aspects of the evaluation at all visits, except for implementation of Individualized Family Service Plans. A final site review was conducted in May 1990, to discuss the evaluation and intervention for the infants under the EIRI protocol.

In addition to verifying that the intervention program continued to be implemented as originally intended, three methods were used to examine parental participation in the intervention. First, the interventionists tracked the number of center and home based visits that an infant attended during each month. Second, the interventionists asked the parents once a month to estimate the amount of time during the past week that they spent working with their infant on activities suggested by the interventionist. When the interventionist recorded this information, they also rated the parents' accuracy of estimation. Finally, the interventionist were asked to rate the parents once a year on three aspects of their participation in the intervention program. The interventionists used three point scales (1 = low, 2 = average, and 3 = high) to rate the parents' attendance of scheduled appointments, their knowledge of the information that the intervention was designed to provide, and their support of the goals and methods of the intervention program. Table 10.3 represents the data from these treatment verification methods.

Cost of alternative interventions. The cost per child for the early intervention group represents an accumulated cost of intervention from October 1986 to October 1988. The total program cost for two years, and two phases of intervention as outlined under the intervention program description. The cost per child for the later intervention group represents the cost for services from the date these children turned 12 months of age and services began until October 1988, the end of FY 1987-88. In Table 10.4, cost per child estimates in Years 1 and 2 are

Table 10.3

Parent Participation in the Phase I Sensorimotor Intervention

Variables	n	$\bar{x}$	(SD)	Range	Minimum	Maximum
Percent of scheduled visits attended	29	64	(23)	1.03	17	120
Number of hours per month working with♦ interventionist	29	1.28	(.46)	2.06	.34	2.4
Number of Hours per week working with child on suggested activities (Parent Report)	16	2.2	(.71)	2.21	1.3	3.5
Interventionists' rating of accuracy of* parents' time report	16	2.3	(.6)	2	1	3
Interventionists' rating of quality of* parent participation						
1. Attendance	29	2.14	(.79)	2	1	3
2. Knowledge	29	2.24	(.74)	2	1	3
3. Support	29	2.17	(.76)	2	1	3

♦ Based on percentage of scheduled visits attended x 2 hours per visit.

* 1 = low, 2 = Average, 3 = high

adjusted for inflation so that all figures are comparable in 1990 constant dollars. In addition, at the bottom of Table 10.4, estimates are adjusted to reflect real discount rates of 3 and 5 percent.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group: in Year 1, the total number of children receiving intervention was 24; in Year 2, 38 children (both treatment and control) were receiving services. As illustrated in Table 10.4, program costs included direct service and program and university administration, occupancy, equipment, transportation, materials and supplies, and telephone used for the respective groups.

Direct service personnel costs included wages and benefits for the physical therapist, and the interventionists. Each of these are pro-rated according to actual time spent on intervention-related activities. Program administrative costs include

Table 10.4

Cost Per Child for South Carolina IVH Site (1990 Dollars)

Resources	Early Intervention	No Intervention
1. **Undiscounted**		
Agency Resources		
Direct Service Personnel	$3,140	$1,220
Administration		
Program	1,660	771
University	1,435	639
Occupancy	307	101
Equipment	56	17
Transportation	600	443
Materials/Supplies	146	74
Telephone	71	36
Subtotal	**$7,415**	**$3,301**
Contributed Resources		
Parent Time	2,500	1,221
Others	16	
Subtotal	**$2,516**	**$1,221**
TOTAL	***$9,931***	***$4,522***
2. **Discounted at 3%:**		
Total Agency Resources	8,237	3,607
Total Resources	11,029	4,941
3. **Discounted at 5%:**		
Total Agency Resources	8,822	3,821
Total Resources	11,809	5,235

* Totals may not add up due to rounding errors.

the pro-rated salaries and benefits for the psychologist, coordinator, interventionist, and secretary according to their time spent on administrative duties for the intervention. Research costs in this, and all other resource categories, naturally, are excluded. The university administrative cost is based on the university indirect rate for general, departmental, and sponsored projects administration (24%). Occupancy charges were calculated based on the University's rate per square foot for office space, utilities, maintenance, and insurance pro-rated according to program usage. Equipment costs include the cost of office furniture and intervention equipment. These costs are based on market replacement values for each item which are annualized at a rate which accounts for interest and depreciation and pro-rated according to program usage to determine the annual equipment cost. Agency transportation cost for home visits were calculated at $.21 per mile based on actual mileage. In addition, the project reimbursed several parents for bringing their child to the center for treatments in Year 2.

Because the program relies heavily on parent participation for both home visits and conducting intervention with their own child in the home, the opportunity cost of parent time was also included. These costs are presented as "contributed resources" on Table 10.4. Parent time includes time spent in (1) center and home visit sessions with either the physical therapist or the interventionist; and (2) intervention activities recommended by the program for each parent and child at home. Parents spent an average of 121.2 hours per year in session with professionals and conducting intervention activities at home. Parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for full-time work for women in the U.S.

Thus, for children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents, the undiscounted cost of the program was $9,931 per child while for children entering the program later at 12 months, the undiscounted cost was $4,522 including the value of parent time. The cost per child for intervention in Year 2 is less than Year 1 because of the greater emphasis on physical therapy in Year 1 which costs more than services from the interventionist. This served to reduce costs allowing the program to serve more children and further reduce the cost per child.

Data Collection

Data were collected for this study to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children who experienced intraventricular hemorrhage at birth and the unique experiences of their families.

A local diagnostician who was unaware of the group membership of children or the specific purposes of the study was hired to administer the pre- and posttest measures. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations was performed.

Pretest. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months), all infants[1] were tested with the Battelle Developmental Inventory (BDI). At the same time the parents completed the Parenting Stress Index (PSI), an assessment of the stress perceived by the parents; the Family Support Scale (FSS), a measure of the number of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the cohesiveness and adaptability of the family. All test and questionnaire protocols were sent to the program coordinator for scoring and placement in a data file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the newborn.

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[1] *The first nineteen infants who were enrolled only received the Battelle Developmental Inventory at pretest.*

Posttest. Posttesting occurred first at 12 months corrected age and annually thereafter. The posttest battery was administered by the same diagnostician who was "blind" to the subject's group assignment. The child was given the BDI; the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the previous year, and a parent demographic survey. Additionally, videotapes were made of mother-infant interaction in a semi-structured play session and of infant motor development. Parents were paid a $30 incentive for the testing and videotaping.

The videotape of motor functioning followed a specific script. The child performed the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child were asked to play together for 15 minutes "as they would at home." Then, for one minute, the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent was asked to leave the room for 45 seconds, and taping continued for two minutes after the parent returned to the room.

The posttest battery was designed to provide information regarding the child's developmental change in the first 12 months (and yearly thereafter), and the effect of intervention services upon the child's development. Change in the family during this time, were also examined. The posttest battery consisted of the same measures that were used at pretest.

Results and Discussion

The purpose of this study was to examine the effectiveness of an early, intensive motor intervention compared to a delayed comprehensive developmental intervention for a group of infants at risk for developmental delays because of a history of intraventricular hemorrhage or very low birthweight.

Comparability of Groups on Pretest Measures

Table 10.5 represents the comparability of groups on the pretest child and family functioning measures. There were no statistically significant differences on any of the pretest measures of infant or family functioning.

Effects of Early Versus Delayed Intervention on Measures of Child and Family Functioning

The effects of the early intervention program on child functioning as measured by the Battelle Developmental Inventory were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b) to statistically adjust for any pretreatment differences between the groups. For either purpose, the degree to which ANCOVA is useful depends on the correlation between the covariates selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the

Table 10.5

South Carolina Medically Fragile Study: Comparability of Groups on Pretest Measures

	GROUPS								
	DELAYED INTERVENTION			EARLY INTERVENTION					
Variable	$\bar{X}$	(SD)	N	$\bar{X}$	(SD)	N	ANOVA F	p VALUE	ES[♣]
• Age in Months at Pretest									
• Battelle Developmental Inventory (BDI)									
DQs for:									
Personal/Social	89	(53)	30	92	(50)	34	.05	.82	.06
Adaptive Behavior	66	(58)	30	73	(57)	34	.22	.64	.12
Motor	80	(26)	30	83	(27)	34	.20	.50	-.12
Communication	67	(48)	30	65	(43)	34	.07	.78	-.06
Cognitive	62	(51)	30	59	(43)	34	.07	.79	-.14
TOTAL	78	(46)	30	71	(38)	34	.42	.51	-.15
• Parenting Stress Index (PSI)									
Child Related	108	(20)	19	116	(15)	27	2.26	.14	-.40
Other Related	116	(26)	19	127	(27)	27	2.01	.16	-.42
TOTAL	224	(41)	19	243	(39)	27	2.56	.12	-.46
• Family Adaptation and['] Cohesion Evaluation Scales (FACES)									
Adaptation	6.6	(3.8)	18	6.3	(3.8)	25	.07	.79	.08
Cohesion	4.7	(2.7)	18	6.0	(4.3)	25	1.22	.28	.14
Discrepancy	8.2	(10.6)	18	12.1	(12.6)	25	1.11	.29	-.37
TOTAL									
• Family Resource Scale[♠] (FRS)	120	(18)	16	113	(28)	24	.67	.41	-.39
• Family Support Scale[♠] (FSS)	31	(14)	18	27	(12)	25	1.38	.25	-.28
• Family Index of Life[♠] Events and Changes (FILE)	11	(6)	18	11	(11)	25	.002	.96	0.0

[♣] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

['] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♠] Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. Accordingly, these data were analyzed in a three-stage process. First, pretest BDI scores, demographics, and medical demographics were examined for potential differences. As reported above, the only statistically significant pretest difference between the groups was in the proportion of males in the groups.

The second stage of the analyses was to examine the relations between posttest Battelle scores and the pretest measures via multiple regression analyses, again looking for potential covariates. These analyses indicated that a variety of pretest variables accounted for significant proportions of the variance in the posttest Battelle scores. Thus, differences between the early and delayed intervention Groups were analyzed using one-way univariate analyses of covariance, with BDI pretest scores as covariates. Table 10.6 represents the data for the one year posttest BDI scores for the early and delayed intervention groups and indicates the specific covariates used in each analysis. These results indicate significant differences between the groups, with the early intervention group scoring lower than the delayed intervention group on 4 of the eight domains.

As discussed above, only a subsample of the overall group received the complete pretest battery. Forty-five subjects received both a one-year posttest and all of the family measures (PSI, FSS, FRS, FACES III, and the FILE) at the pretest. Thus, the use of pretest measures other than the BDI as covariates would have reduced the number of subjects who had posttest data available for analyses. Thus, the family measures were analyzed without covariates. These results are also represented in Table 10.6. There were no significant differences between the early and delayed intervention groups.

Table 10.6

First Posttest Measures of Child and Family Functioning for Alternative Intervention Groups for South Carolina Medically Fragile Study

		GROUPS										
		DELAYED INTERVENTION				EARLY INTERVENTION						
VARIABLE	Covariates^	$\bar{X}$	(SD)	Adj. X	n	$\bar{X}$	(SD)	Adj. X	n	ANCOVA F	p Value	ES♣
• Age in Months at Posttest		12	(1.5)		30	12	(.9)		34	1.47	.23	.00
• Battelle Developmental˚ Inventory (BDI)												
DQs for:												
Personal/Social	2, 3	83	(28)	84	30	72	(24)	72	34	4.72	.034	-.43
Adaptive Behavior	1, 2, 3	96	(31)	97	30	91	(28)	91	34	.84	.360	-.19
Gross Motor	5, 6	82	(38)	83	30	68	(29)	67	34	4.10	.047	-.42
Fine Motor	4, 2	89	(43)	90	30	79	(32)	79	34	1.82	.182	-.26
Total Motor	1, 6	83	(32)	83	30	70	(25)	69	34	4.38	.041	-.44
Communication	2, 6	91	(33)	92	30	77	(32)	76	34	3.77	.057	-.48
Cognitive	2, 6	88	(35)	88	30	85	(35)	84	34	.23	.63	-.11
TOTAL	1, 2, 6	92	(32)	92	30	82	(26)	82	34	2.53	.117	-.31
• Parenting Stress Index (PSI)												
Child Related		112	(24)		24	113	(21)		29	.02	.90	-.04
Other Related		123	(28)		24	126	(36)		29	.08	.78	-.11
TOTAL		235	(47)		24	239	(52)		29	.06	.80	-.09
• Family Adaptation and' Cohesion Evaluation Scales (FACES)												
Adaptation		5.9	(6.4)		20	6.3	(5.4)		27	.03	.87	-.06
Cohesion		5.9	(2.9)		20	5.8	(4.0)		27	.00	.97	.03
Discrepancy		13.4	(15.6)		20	11.2	(12.3)		27	.28	.60	.14
TOTAL		9.2	(5.2)		20	9.7	(4.9)		27	.09	.77	-.10
• Family Resource Scale (FRS)♠		117.0	(18.0)		21	123	(30.0)		27	.66	.42	.33
• Family Support Scale (FSS)♠		30	(15.0)		21	31	(17.0)		27	.04	.84	.07
• Family Index of Life♠ Events and Changes (FILE)		9.0	(7.0)		18	7.7	(5.9)		24	.45	.50	.19

^ Covariates: Pretest BDI Scores 1 • Total BDI score, 2 • BDI Personal Social, 3 • BDI Adaptive Behavior, 5 • BDI Gross Motor, 6 • BDI Total Motor

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

' Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

♠ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports, Resources, and stressful life events occurring.

The results of the analyses of the child and family measures indicated that after one year of intensive motor oriented intervention, the infants in the Early Intervention group were performing more poorly in several developmental domains. It is particularly important that the infants were doing more poorly in the gross

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motor domain as the intervention during the first year was specifically targeted to motor development.

The same analysis procedure was followed for the second posttest which was given at 2 years of age. Fifty-nine infants received this posttest. The results of the analyses of the child and family measures are presented in Table 10.7.

At the second posttest, there were no significant differences between the two groups on the Battelle Developmental Inventory although the early intervention group performed better on the fine motor domain (ES = .30).

On the family measures, there were no statistically signficiant differences between the groups, but the delayed intervention group had higher scores on the Parenting Stress Index (ES = .38), the Family Resource Scale (ES = .33) and the Family Inventory of Life Events and Changes (ES = .33).

Conclusions

It is clear from the analyses of the demographic data of the overall group that random assignment worked well and created groups which were comparable with respect to relevant characteristics of children and families. The groups were balanced on all demographic and medical characteristics except the proportion of males in the groups. This imbalance did not, however, affect the outcomes. In addition, the groups did not differ on any of the pretest child or family measures. The results of the analysis of pretest child and family measures also indicate that random assignment provided balanced groups for this study. There were no significant differences between the early and delayed intervention groups at pretest.

The results of the first year posttest indicate that after one year of intensive motor oriented intervention, the early intervention group demonstrated poorer developmental progress. The early intervention group preformed more poorly on the

Table 10.7

Second Posttest Measures of Child and Family Functioning for Alternative Intervention Groups for South Carolina Medically Fragile Study

		GROUPS										
		DELAYED INTERVENTION				EARLY INTERVENTION						
VARIABLE	Covariates˜	X̄	(SD)	Adj. X̄	n	X̄	(SD)	Adj. X̄	n	ANCOVA F	p Value	ES♣
• Age in Months at Posttest 2												
• Battelle Developmental' Inventory (BDI)												
DQs for:												
Personal/Social	1, 9	72	(21)	70	23	70	(23)	71	26	.01	.94	.05
Adaptive Behavior	1, 3	86	(28)	84	23	79	(25)	81	26	.35	.56	-.11
Gross Motor	1, 6	78	(29)	75	23	73	(35)	74	26	.09	.771	-.03
Fine Motor	1, 6	80	(30)	77	23	83	(28)	86	26	2.60	.114	.30
Total Motor	1, 6	77	(26)	74	23	75	(30)	76	26	.12	.72	.08
Communication	7, 9	71	(20)	69	23	68	(25)	69	26	.11	.75	.00
Cognitive	1. 10	70	(24)	69	23	63	(23)	65	26	.82	.37	-.17
TOTAL	1, 3	75	(21)	73	23	72	(22)	74	26	.09	.76	.05
• Parenting Stress Index (PSI)												
Child Related		109	(20)		23	112	(22)		26	.24	.62	-.15
Other Related		120	(22)		23	131	(26)		26	2.35	.13	-.50
TOTAL		229	(37)		23	243	(43)		26	1.51	.23	-.38
• Family Adaptation and' Cohesion Evaluation Scales (FACES)												
Adaptation		5.7	(3.8)		23	5.5	(3.6)		25	.04	.84	.05
Cohesion'		6.3	(6.3)		23	7.5	(5.6)		25	.49	.49	-.19
Discrepancy		10.5	(8.6)		23	11.8	(10.1)		25	.25	.62	-.15
TOTAL		9.1	(6.3)		23	10.0	(5.1)		25	.27	.61	-.14
• Family Resource Scale▲ (FRS)		113	(19)		23	107	(21)		26	1.27	.26	-.32
• Family Support Scale (FSS)▲		32	(15)		23	37	(11)		26	2.13	.15	-.33
• Family Index of Life▲ Events and Changes (FILE)		8	(6)		23	10	(11)		25	.63	.43	-.33

˜ Covariates, Posttest 1 BDI Scores: 1 = Total score, 2 = Personal Social, 3 = Adaptive Behavior, 4 = Fine Motor, 5 = Gross Motor, 6 = Total Motor, 7 = Expressive Communication, 9 = Total Communication, 10 = Cognitive

♣ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size)

' Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

▲ Analyses for the FSS, FRS, and FILE are based on raw scores indicating the number of Supports or Resources indicated by the family as being available. Higher scores are considered better.

BDI; family measures did not indicate any effects of the intervention. The results of the analyses of the second posttest indicated no significant differences between the groups. In light of the differences between the groups on the first posttest, this result is intriguing. Figure 8.1 represents the data from the Pretest, Posttest

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#1, and Posttest #2. Note that the first posttest scores for both the intervention and nonintervention groups were higher than the pretest scores. Note also that the scores for both groups on the second posttest regressed toward the level of the pretest.

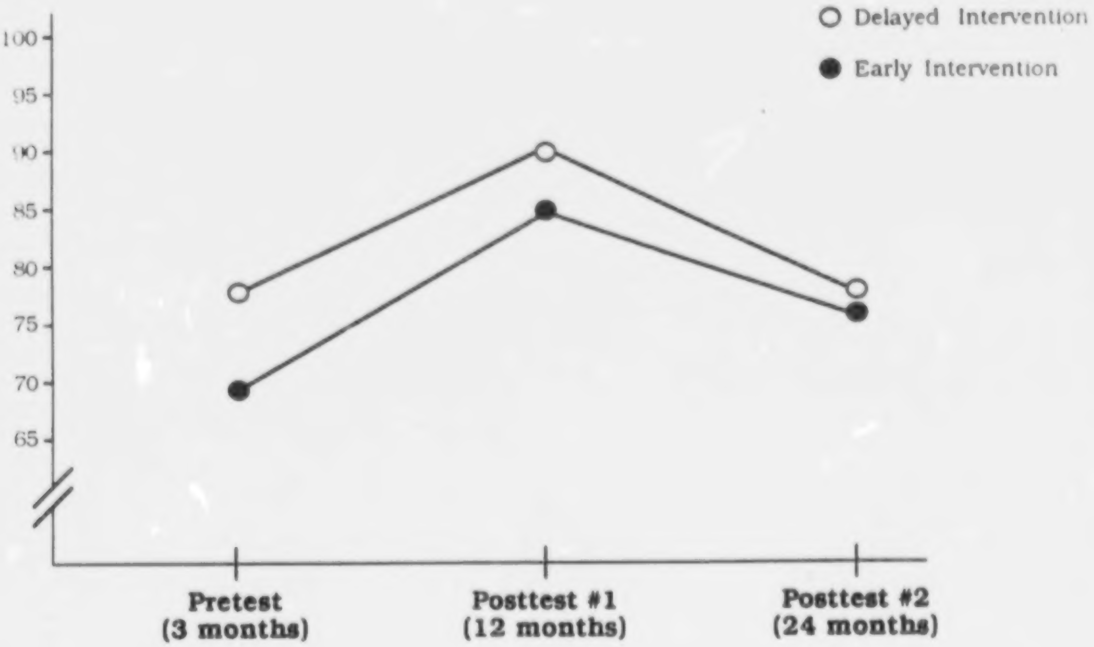

Figure 8.1: BDI Total Scores at Pretest, Posttest #1, and Posttest #2

The results of this study concur with those of two recently released studies (Goodman et al., 1985; Palmer et al., 1988). While there are important methodological differences between this study and those performed previously, the pattern of results begins to suggest that early intervention which is directed mainly or exclusively toward facilitation of motor development in the first year of life may not be effective for this population. It remains to be seen whether interventions that are more broadly based and are more intensive would be effective in preventing or remediating developmental problems.

SALT LAKE CITY IVH PROJECT

Project #9

COMPARISON: Grades I, II, III, and IV Intraventricular Hemorrhage Infants (IVH) --Services begun at 3 months adjusted age vs. services begun at 18 months adjusted age.

LOCAL CONTACT PERSONS: Gary Chan, University of Utah Medical Center; Jack Dolcourt, Primary Children's Medical Center

EIRI COORDINATOR: Nancy Immel

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 4-10-1991

Rationale for the Study

Conventional wisdom suggests that the earlier interventions are initiated with children who have, or who are at risk for developing, disabilities, the greater will be the positive effects of those interventions. White et al. (1985-86) reported that 18 of 24 reviewers of early intervention literature indicated that earlier intervention was more effective than later intervention. In a meta-analysis of 74 studies of early intervention with children with disabilities from birth to five years of age, however, Casto and Mastropieri (1986) concluded that there was little evidence to support the "conventional" wisdom that earlier was better.

An important question related to the age-at-start issue which needs further clarification is the age at which intervention should start for infants who have serious medical problems and who routinely spend up to three months in intensive care units. Because infants who experienced intraventricular hemorrhage (IVH) in the neonatal period have been identified as a population at risk for developing subsequent disabilities, this study compared the effects of intervention initiated "early" with the effects of intervention initiated "later" in the lives of medically-compromised young infants with IVH.

Review of Related Research

Given that IVH infants comprise a subject population which is at extreme risk for experiencing neonatal complications associated with developmental dysfunctions (e.g., severe asphyxia, intrauterine growth retardation, neonatal meningitis, encephalitis, seizures, bronchopulmonary dysplasia, respiratory distress syndrome, apnea, and vision and hearing problems), it was deemed important to determine if interventions beginning early in life could prevent the development of later disabilities in IVH infants and reduce the levels of stress experienced by the families of these infants.

The National Center for Health Statistics (1989) reports that 6.8% of all live births in 1986 were of infants weighing less than 2500 g; infants weighing less than 1500 g accounted for 1.2% of live births. Approximately 40% of low birthweight infants experience IVH (Bowerman, Donne, Silverman, & Joffe, 1984).

An estimated 50-60% of infants who suffer IVH survive (Volpe, 1981); however, information on the future developmental progress in this population is limited and controversial (Hynd et al., 1984). Sostek et al. (1987) found that although level of Grade I or II vs. Grade III or IV IVH was not related to Bayley mental and motor scores at two years of age as a group, 40% of the children suffering IVH showed severe delays. At older ages, the findings are somewhat equivocal. For example, Williamson et al. (1982) found that 29% of IVH Grade I and II LBW infants exhibited moderate disabilities by the age of 3; whereas Papile et al. (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities by the third year of life. Bozynski et al. (1984) suggested that neonatal IVH typically resulted in motor rather than mental impairment, particularly in survivors of Grade IV hemorrhage.

Recent early intervention literature has described various ages at which interventions with low birthweight infants began and has reported conflicting results. Resnick et al. (1988) reported that the combination of in-hospital multimodal intervention and home-based developmental intervention during the first 12 months of life resulted in significant gains in child mental development and in the quality of parent-child interactions. These findings are in direct conflict with the findings of Palmer et al. (1988), who found that after 12 months of infant stimulation and physical therapy that the comparison group outperformed the experimental group in both motor and cognitive areas.

More recently, the Infant Health and Development program (1990), a multisite, randomized study, compared the effects of an intensive, educationally-focused, early intervention program which included a family support and a pediatric follow-up component to a pediatric follow-up only program. Results of this study indicated that children who received the intensive early intervention performed the same as control group children during Years 1 and 2, but performed better on the Stanford-Binet Intelligence Scale and had fewer behavior problems at 36-months corrected age than did children who received pediatric follow-up alone. In sum, the recent research findings regarding interventions begun early in life are somewhat equivocal and support the need for further studies.

Previous to this study, IVH infants in Utah received only medical follow-up. This situation provided an opportunity to test an early versus later intervention hypothesis by offering more intense services to one group of IVH survivors. EIRI staff had worked closely with Primary Children's Hospital and the University of Utah Medical Center in the past, and had established an excellent working relationship for this longitudinal study.

Overview of Study

This study examined the differential effects on children and families of beginning a home-based early intervention program at 3 months corrected chronological age (age corrected for prematurity),[1] to a comparison group which received the medical follow-up services that had been available in the past until they were 18 months of age (also corrected for prematurity). At 18 months, children in both groups received a similar home-based intervention program.

Prior to the implementation of services for this research project, the services to all infants included neonatal care at the respective hospitals and referral to the Utah State Department of Health Neonatal Follow-Up Clinic or follow-up from private physicians. Previous funding for these services was provided by the Utah State Department of Health. However, those parents who did not access the NICU follow-up clinic paid for services themselves. This was the standard level of care for all infants released from an NICU in the treatment area. Subjects in the delayed intervention group received no other services associated with this project until they were 18 months of age. However, parents were free to access other services in the community if they desired. Parents were queried annually about services they accessed during the time of the study, and these results will be reported later in this report.

Intervention services began with referral to the project by staff at the University of Utah and Primary Children's Medical Centers, who initially contacted the parents and referred the interested parents to the site coordinator. When a child was enrolled, the project provided a package of services delivered by independent providers, including licensed physical or occupational therapists, child development specialists, and trained developmental examiners. Services provided by these professionals were coordinated by the EIRI site coordinator.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

Methods

This section presents the procedures for subject recruitment and assignment, the demographic characteristics of the groups, a description of the alternative intervention programs, and a discussion of the procedures for treatment verification and cost analysis.

Subjects

There are currently 57 children between 10 months of age (age corrected to 40 weeks to control for prematurity) and 54 months (actual ages were used after the children reach three years of age) enrolled in the study. Subject recruitment ended in March 1989, at which time a total of 58 subjects were enrolled.

Recruitment. Infants qualified for participation in the study if they were a patient in a Neonatal Intensive Care Unit (NICU) at either Primary Children's Hospital or University of Utah's Medical Center, if they experienced intraventricular hemorrhage (IVH), and if they resided in the catchment area for treatment. Subjects were matched on severity of hemorrhage and birthweight prior to random assignment to experimental or control groups. Severity of IVH was divided into mild (Grades I and II IVH) and severe (Grades III and IV IVH).

Assignment to Groups. Subjects who met the inclusion criteria were identified upon discharge from the respective NICU. Parents of eligible infants were contacted via mail by the medical center in which the infant was a patient the month prior to reaching 3 months corrected age. Infants who met the study criteria were considered for inclusion if the parents indicated a willingness to participate in either of the experimental conditions, depending upon where random assignment placed them. Infants were randomly assigned to the early intervention or delayed intervention conditions by a roll of a four-sided die after stratification by severity of IVH (mild or severe) and birthweight (under 1500 g or over 1500 g). Parents were informed of their infant's assignment after they gave approval to participate in the study.

The only person at the site who knew the actual order of eligibility and enrollment of subjects was the EIRI site coordinator. Additionally, the dates on which infants were identified as being eligible for this study were tracked to ensure that infants were assigned in the order in which they were identified.

Subject attrition. Many of the children in this study had medical concerns which necessitated returning to the hospital for a period of time, yet the study was extremely successful in assessing infants on schedule and had very low attrition. Of the 58 infants enrolled, only one child, who died after the second posttest, was lost to attrition. Thus, 98% of the original sample remained in the study.

To minimize attrition, the interveners and site coordinator in this project maintained updated telephone numbers and addresses for the participants. Data were collected in person or by mail approximately every 6 months for the child's first 18 months and monthly after 18 months, so there was frequent contact with the families. A semiannual newsletter kept parents informed of the study. Arrangements were also made to provide intervention services and assessment for those participants who moved to another state. For example, children were assessed in the states of New Jersey, Georgia, Washington, Wyoming, Colorado, California, and Idaho. In each case, qualified examiners who were "blind" to the child's group membership and specific hypotheses of the study were located to administer follow-up assessments.

Demographic characteristics. Demographic information was gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families.

At the time of the last testing reported herein, most of the children were from families residing in the urban areas surrounding Salt Lake City and Ogden, Utah. Seventy-nine percent of the subjects lived in the Salt Lake City and Ogden area, while 10% lived in rural areas of Utah, Idaho, or Wyoming. Three subjects lived in California, one subject each lived in Nevada, Georgia, and Washington. The current sample is composed of 89% Caucasian infants and 11% non-Caucasian infants from both urban and rural areas. One hundred percent of the participants lived in homes where English was the primary language, and most all (95%) lived in two-parent families. The educational level of the mothers ranged from 8th grade to college graduate, with a mean education level of 13.1 years. The fathers' education level ranged from 9th grade to Ph.D., with a mean of 13.8 years of education. Annual family incomes ranged from $2,500 per year to over $50,000 per year. Median yearly income for the families was $20,001. A comparison of the early and delayed intervention groups on demographic characteristics appears in the Results section.

Intervention Programs

The intervention was conducted in two phases for this project. The first phase provided sensorimotor intervention to the early intervention (experimental) group beginning at 3 months corrected chronological age, while the delayed intervention (control) group received the current level of community service (referral to the NICU follow-up clinic). The second phase, delayed intervention, was received by all infants in both groups. Delayed intervention began when the infants reached 18 months corrected age and consisted of home- and/or center-based intervention services based on the Curriculum and Monitoring System (CAMS).

The Curriculum and Monitoring Systems (CAMS) was designed to meet the educational needs of young children with disabilities served by the Multi-Agency Project for Preschoolers (MAPPS). The project collected data attesting to the efficacy of the program and was validated as an exemplary program for national dissemination by the Joint Dissemination Review Panel (JDRP) of the U. S. Department of Education. It was revalidated in 1985. MAPPS is one of only 21 early intervention projects validated by the JDRP. MAPPS is also a National Diffusion Network (NDN) program and has replication sites nationwide.

Each of the CAMS programs is printed in an easy-to-use block style design and bound in a notebook. This format was selected to allow persons administering the program to photocopy individual pages for use by the parents or trainers working directly with the children. With training, CAMS can be used by parents, teachers, and paraprofessionals in the home or in an institutional/school setting. The five CAMS programs are: (a) receptive language, (b) expressive language, (c) motor development, (d) self-help skills, and (e) social-emotional development.

The ***Receptive Language Program*** teaches the student skills that do not require verbalization but are necessary in the understanding of oral language. Skills include identifying objects, following commands, and touching body parts.

The ***Expressive Language Program*** teaches children general speaking skills, beginning with the formation of sounds and proceeding through the development of simple grammatical sentences. It focuses on language-building and articulation.

The ***Motor Program*** is designed to teach gross and fine motor skills. The program stimulates normal motor development, beginning with raising the head and proceeding through running, hopping, and drawing shapes. This program is intended for children with mild to moderate impairments.

The ***Self-Help Program*** is designed to teach basic skills for self-care. Included in the curriculum are feeding, dressing, personal hygiene, and toileting skills.

The ***Social-Emotional Program*** is designed to teach basic social-emotional skills, including both child-adult and peer interactions.

Early intervention service. At three months corrected age, children in the early intervention group were referred to a licenced physical or occupational therapist for initial sensorimotor evaluation using the CAMS Motor Placement Test. At that time, scheduling and programming were discussed with the family. Frequency of intervention was determined by CAMS test scores, the type and quality of the infant's movement patterns, and the amount of interactive time available to parents. Most infants were seen one to two times per month during the first few months when movement patterns were limited. The treatment schedule was flexible so that weekly visits were scheduled if abnormal patterns or tone were noted, or if significant delays persisted. However, if normal development was occurring with good quality of movement, intervention was limited to monthly or follow-up visits. Similar levels of early intervention program intensity for low birthweight infants have been described by Resnick et al. (1987; 1988), Raugh et al. (1988), Field et al. (1980), Nurcomb et al. (1984), and Piper et al. (1986).

Treatments consisted of individualized activities designed to encourage appropriate movement patterns in a normal developmental sequence. The activities were updated constantly to accommodate progress and were designed to be integrated into daily family routines. Parents were present during treatment sessions which lasted 45 minutes and included a review of progress on treatment goals, direct therapy, and an opportunity for the parent to work with the child. Parents were provided with written and illustrated home program activities. Parents were asked to work with the child at home at least 20 minutes per day, five days per week, on techniques they had learned in the intervention sessions. The level of parental intervention and program involvement was used in analyzing the outcome for the children to determine if degree of parent involvement affected the developmental outcome of the child.

Attendance and progress were monitored on an ongoing basis by the therapist's progress notes. The CAMS placement test checklist was updated as goals were met. If a child required other equipment or services, or if the family needed financial assistance to buy rehabilitation equipment, the physical therapist referred the family to agencies in the Salt Lake City area or attempted to obtain equipment no longer being used by other children. The physical therapist also maintained a supply of equipment which she provided to subjects at no-cost.

Delayed intervention. At 18 months corrected age, the infants in the delayed intervention group also began to receive intervention services. The focus of intervention became center- and/or home-based for both early intervention and delayed intervention children. Therefore, all children at 18 months corrected age were assessed using the CAMS, and goals were established for intervention.

The child development specialist met with the parent and child for one-hour once each month and provided intervention in the area(s) of need identified by the CAMS placement test and by parent concerns. The parent was asked to spend 20 minutes each day 5 days each week providing similar intervention with their child at home. The child development specialist talked with the parent via telephone at least once between clinic appointments to check on progress and answer questions.

A monthly home visit by the child development specialist established goals for the child dependent upon the CAMS placement test. A typical intervention session was 45-60 minutes in duration. Each session began by asking how the child was doing and followed up on any problems (medical, family, etc.) discussed at the last visit. Then, using CAMS, the intervenor assessed the child's progress on the items suggested for home activities in the previous session. If the child passed these items, new activities were suggested and demonstrated. Following the assessment, the intervenor and child played with selected toys designed to teach age-appropriate skills (shape sorters, bead stringing, puzzles, etc.). Before the session ended, the intervenor wrote down the suggested activities, gave examples showing how to teach these activities, provided appropriate toys if necessary, and answered any questions the parent had.

For example, if the objective for a child was to point out facial features, the child development specialist taught the parent an exercise to teach the child facial features. When the next meeting occurred, the child development specialist asked the child to point out facial features. If the child showed competence in that area, a new objective was established. Some children had objectives in several domains, while others had only one. The child development specialist provided recommendations to parents regarding problems or concerns such as toileting or behavior.

If a child in the delayed intervention group was identified by the placement test as having a motor delay, s/he was referred to the physical therapist for motor intervention. Those children in the early intervention group who still required motor services continued meeting with the physical therapist. If a child who received motor services in the early intervention group no longer required those services, s/he terminated services with the physical therapist and received services from the child development specialist only. The physical therapist followed the same procedures outlined in the early intervention service section.

During the final two years of the study, the focus of service provision changed slightly as appropriate community services became more available to young children with disabilities. In compliance with P.L. 99-457, the Utah Departments of Health and Education developed more early intervention and education programs to meet the special needs of these children. While children in the study continued to receive the interventions as previously described, parents were assisted in accessing community services when their children entered the delayed intervention phase. Children received both public and private preschool services, occupational, physical, and speech/language therapies, and services to the hearing and visually impaired.

In summary, all children were involved in individualized intervention services at 18 months corrected age. Some children also obtained other services in the community. The access of services by the family was monitored on a yearly basis when parents completed an "additional services form." The results of that assessment are discussed later.

Treatment verification. A number of procedures were implemented to verify that treatment was implemented as intended. Table 9.1 shows treatment verification data for subjects posttested at 18 months CCA (Posttest #1) and 30 months CCA (Posttest #2). Verification data include the following.

1. *Collection of attendance data*. Both home visits and clinic visits were recorded in the subject's file. Phone contacts also were noted in the subject's chart by both the physical therapist and child development specialist. For the delayed intervention group, statistics regarding utilization of the NICU follow-up service were obtained from that agency. Only 2% of the children referred to the NICU follow-up service actually used that service. Between Pretest and the 18-month Posttest at 18 months corrected age, infants in the early intervention group attended an average of 43 physical therapy visits. Between the posttest at 18 months corrected age and the posttest at 30 month corrected age, the average number of intervention sessions reflects visits from the physical therapist, visits with the developmental specialist, and visits to community early intervention services.

2. *Parent satisfaction with program*. Annually, parents were requested to complete a questionnaire regarding their satisfaction with the intervention services delivered by this program. The questionnaire consisted of seven program qualities that were rated on a scale of 1-4, with 4 being the most favorable rating. The seven items were averaged to give a rating of satisfaction which ranged from 1-4. Parents in both the early and delayed intervention groups consistently rated the intervention favorably and group means ranged from 3.40 to 3.67.

Table 9.1

Treatment Verification Data for Salt Lake City Age-at-Start Study

	3 - 18 months CCA (Posttest #1)							19 - 30 months CCA (Posttest #2)								31 - 42 months CCA (Posttest #3)							
	Delayed Intervention			Early Intervention				Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES
● Intervenor Ratings of Parents:[*][♦]																							
Involvement w/program				2.6	(.6)	25		2.7	(.6)	24	2.4	(.8)	25	.11	-.50	2.9	(.3)	19	2.4	(.8)	21	.01	-1.67
Knowledge of Children's Condition and Program				2.2	(.7)	25		2.7	(.5)	24	2.2	(.8)	25	.01	-1.00	3.0	(.2)	19	2.8	(.5)	21	.02	-1.00
Support of Child's Program				2.3	(.6)	25		2.7	(.6)	23	2.2	(.7)	25	.04	.83	2.6	(.6)	19	2.6	(.7)	21	.95	.00
● Hours of sensory motor services provided by project				43.0	(156)	26	.41	183.5	(193)	18	104.0	(274)	23	.30		522.0	(403)	12	147.6	(279)	9	.03	
● Hrs of early intervention[@] services provided by project				116.9	(239)	26	.83	241.1	(191)	18	147.8	(264)	23	.22		554.8	(400)	12	232.4	(285)	9	.05	
● Parent rating of satisfaction with child's program[+]				3.7	(.5)	24		3.7	(.6)	17	3.4	(.5)	15	.22	.50	3.4	(.9)	13	3.5	(.9)	17	.66	.11

[+] Parents involved in each alternative type of intervention rated their satisfaction with the program on a four-point scale (4 = excellent, 3 = good, 2 = fair, 1 = poor) in response to seven questions.

[*] Scores based on a three-point rating (1 = low, 2 = average, 3 = high) completed by the intervenor most involved with the family.

[♦] Infants and families in the Delayed Intervention group received no early intervention services from the SLC/IVH project prior to 18 months of age; therefore, intervenor ratings of parents, total intervention sessions received, and parent ratings of satisfaction are not reported. Some infants in the Delayed Intervention group did receive community-based services as reflected by Additional Services data.

[@] These services include sensory motor and developmental intervention.

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3. ***Intervenor ratings of parents***. Intervenors rated the parents annually on their support of, and involvement with, their child's program, and on their knowledge of their child's condition and program. The parent qualities were rated on a scale of 1-3, where 3 represented the most favorable rating. Mean scores ranged from 2.20 to 2.71, indicating that intervenors rated parents as having above average parent involvement qualities and as knowing a great deal about their child's condition.

At Posttest #2 and #3, parents of children in the delayed intervention group were rated as having significantly more knowledge of their child's condition and program and significantly more support of the program than parents in the early intervention group.

4. ***Site review***. Formal site reviews were conducted during each year of the project. The last formal site review of the Salt Lake City IVH project was completed on August 17, 1990. Those participating in the site review included the site coordinator, the physical therapist, and two child development specialists. The purpose of the review was to collect information about the nature and quality of early intervention services that were delivered to verify that the research conducted by EIRI was implemented as intended, and to collect needs assessment data which would be useful to site administrators.

The site review was conducted as a part of the treatment verification process which is described in the Treatment Verification Handbook for Research Sites (Frede, 1988), and was implemented according to the general procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Part II of the handbook. The site review took place at K2D2, the facility where most of the sensorimotor and CAMS interventions were delivered and included a review of eight randomly-selected subject records, observations of one sensorimotor and one CAMS intervention session, interviews with intervenors, and inspection of the facility.

The review team found that there were substantial differences in the services provided to each group. Intervention services judged to be of high-quality were provided to the early intervention group prior to 18 months CCA and to both groups after 18 months CCA. Assessment procedures were carried out regularly, appropriate plans and records documenting interventions and child progress were in place. It was found that several of the older subjects in the study were working on the final objectives in the CAMS curriculum.

Cost of Alternative Interventions.

The cost per child for the early intervention group (23 children) represents an accumulated cost of intervention form July 1986 to July 1988, the total program cost for two years and two phases of intervention as outlined under the intervention program description. The cost for services was from the date these 29 children turned 18 months of age and services began until 1988, the end of FY 1987-88. In Table 9.2, all cost estimates were adjusted for inflation to 1990 dollars. In addition, at the bottom of the table, the figures were discounted at 3% and 5%.

To arrive at the cost per child, total program costs were determined for each group and divided by the number of children in the group. As illustrated in Table 9.2, program costs included direct service and program and university administration, occupancy, equipment, transportation, and materials and supplies used for the respective groups.

Personnel costs included wages and benefits for the physical therapist, the developmental specialist, diagnosticians, a graduate assistant, and a secretary. Each of these were pro-rated according to actual time spent on intervention-related activities. Research costs in this, and all other resource categories, naturally, were excluded. Program administration included salaries and benefits for the percentage of FTE administrative personnel worked on the project. The university administrative cost applied to the small portion of the project that was operated

Table 9.2

Cost per Child for Salt Lake City IVH Site (1990 dollar)

Resources	Early intervention (n = 23)	Delayed intervention (n = 29)
1. **UNDISCOUNTED:**		
Agency Resources		
Direct service personnel	$ 2,101	$ 693
Administration		
program	395	127
university	126	40
Occupancy	250	78
Equipment	149	45
Transportation	49	19
Materials/supplies	60	30
SUBTOTAL	$ 3,130	$1,032
Contributed Resources		
Parent Time	2147	716
Parent Transportation	157	97
SUBTOTAL	$ 2,304	$ 813
Total	**$ 5,434**	**$1,845**
2. **DISCOUNTED AT 3%:**		
Total Agency Resources	$ 3,491	$1,127
Total Resources	6,058	2,015
3. **DISCOUNTED 5%:**		
Total Agency Resources	$ 3,747	$1,194
Total Resources	6,501	2,135

*Totals may not add up due to rounding errors.

out of Utah State University. For this, the university indirect rate for general, departmental, and sponsored projects administration was used (31.78%). Occupancy charges included rent paid for office space, utilities, maintenance, and insurance. Equipment costs included the cost of office furniture, computers, intervention toys and treatment equipment, and a supply of equipment available for loans to parents (seating devices, walkers, etc.). These costs were based on market replacement values for each item and annualized at a rate which accounted for interest and depreciation to determine the annual equipment cost. Agency transportation costs for home visits were calculated at $.21 per mile based on actual mileage.

Because the program relies heavily on parent participation for both intervention and, as the child got older, for transportation to the center, the opportunity cost of parent time was also determined. These costs were presented as "contributed resources" on Table 9.2. Parent time included time spent in (1) center and home visit sessions with either the physical therapist or the developmental specialist at one hour each; (2) intervention activities recommended by the program (20 minutes daily) for each parent and child at home; and (3) transportation time and expenses. Parents spent an average of 142 hours in Year One and 71 hours in Year Two in session with professionals and conducting intervention activities at home. Parent transportation costs in Year Two were gathered via telephone interview during which parents reported the number of trips taken to the center, the round-trip distance, and travel time. As reported in the economic section of the report, parent time was assigned the value of $9 per hour based on the average hourly earnings plus benefits for all working women in the U.S.

Thus, for children entering the program at 3 months adjusted age and receiving two years of individualized intervention from both professionals and their professionally trained parents the undiscounted cost of the program was $5,434 per child; for children entering the program later at 18 months, the cost was $1,845, including the value of parent time. The cost per child for two years of intervention is more than twice the cost for one year. This can be attributed to the emphasis on physical therapy in Year 1, which cost more than services from the developmental specialist. At 18 months, the program switched its emphasis for all children in the program from physical therapy to speech, self-help, social, and other age-appropriate skills.

Data Collection

Data were collected to determine the effects of intervention upon the child and the family. The assessment instruments were chosen to provide some consistency of data collection across sites, but also to provide information about children with intraventricular hemorrhage at birth and the unique experiences of their families. Additional assessments described in this section were administered as the subjects developed additional skills not present in younger children. Table 9.3 presents a schedule of pre- and posttest measures and the ages at which they are administered.

Table 9.3

SLC/IVH

	Pretest			Posttest 1	Posttest 2	Posttest 3	Posttest 4
Age (months)	3	6	12	18	30	42	54
Battelle Developmental Inventory	X			X	X	X	X
FSS	X			X	X	X	X
FRS	X			X	X	X	X
FACES	X			X	X	X	X
Demographics	X			X	X	X	X
FILE	X			X	X	X	X
PSI	X			X	X	X	X
Additional Services				X	X	X	X
Child Health				X	X	X	X
Binet Screening Test					X	X	X
Preschool Language Scale						X	X
Draw-A-Person							X
Visual Motor Integration							X
Infant Temperament Questionnaire		X					
Toddler Temperament Questionnaire					X		
Carey Behavioral Style Checklist							X
Child Behavior Checklist							X
Parent-Child Interaction Video			X		X	X	X
Motor Video			X				

Infants were pretested by the child development specialist, who did not know the group assignment of the child. Since there was a chance that the child development specialist could have learned of a child's assignment by posttesting, posttest diagnosticians were chosen who had no involvement with the project or the interveners. In this way, it was ensured that diagnosticians were "blind" to the child's group assignment in the study.

Child functioning was measured at pre- and posttests with the Battelle Developmental Inventory (BDI). The BDI is a norm-referenced, standardized assessment of skill development in children from birth to 8 years of age and assesses five developmental domains: personal social, adaptive, motor (gross and fine), communication (receptive and expressive), and cognitive.

Family functioning was also assessed at pretest and at each posttest. The measures of family functioning included: the Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness and adaptability of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available for families with young children; the Family Resource Scale (FRS), a measure of different kinds of resources available to the family, the Family Inventory of Life Events and Changes (FILE), an assessment of the life events and changes experienced by the family during the previous 12 months. Family demographic information was gathered through the Parent Survey.

Recruitment, training, and monitoring of diagnosticians. Rigorous certification procedures and requirements were implemented to ensure the qualifications and reliability of the diagnosticians administering assessments for the SLC/IVH study. Diagnosticians were required to independently become familiar with the BDI through study of the test manuals and viewing of a videotaped test administration. The diagnosticians then completed a 1½ day BDI administration training session conducted by a certified assessment trainer. During the training session, BDI testing procedures were explained, demonstrated, and practiced. Following the training session, diagnosticians completed three practice BDI administrations. The final practice administration was videotaped and then reviewed by the assessment coordinator. After the assessment coordinator verified that the diagnostician had correctly administered the test, the diagnostician began testing children for the study. Three diagnosticians completed the requirements to administer the pretest and posttest measures. One diagnostician had a Ph.D. in psychology, and two were Ph.D. candidates in psychology. The Ph.D. candidates were recruited from Utah State University and the University of Utah Graduate Schools.

To maintain records on the continued quality of the test results, shadow scoring of 10% of test administrations for each diagnostician was conducted by another trained diagnostician who had three years of experience in administering the BDI. Interrater reliability indicates that the diagnosticians are administering the tests with a reliability level above .90. Testing was scheduled directly with the diagnosticians by the site coordinator.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months), all infants were tested with the Battelle Developmental Inventory (BDI); parents completed the Parenting Stress Index (PSI), the Family Support Scale, (FSS), the Family Resource Scale (FRS), the Family Inventory of Life Events and Changes (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES III). All test and questionnaire protocols were sent to the EIRI site coordinator for scoring and placement in the EIRI file. Parents were paid $20 for their time in completing the evaluation session. This battery of tests provided information regarding both the infant's developmental level and early family reaction to the new-born.

Interim testing. When infants were 6 months corrected age, their parents were mailed the Carey Infant Temperament Scale to complete. This questionnaire was returned directly to the site coordinator via postpaid mail. Parents were paid $10 for completing the questionnaire.

The Carey Infant Temperament Scale assessed the parents' estimate of the infant's temperament. Scoring categorized the infant into easy, intermediate, slow-to-warm, and difficult categories. This information was compared with the ratings of the videotaped parent/child interaction to determine if the child's perceived temperament affected interactions with the parent. Videotapes of parent-infant interaction and one of motor development were completed by a trained child development specialist or a licensed physical therapist when the infants were 12 months corrected age. These videotaped sequences were rated by trained individuals who were "blind" to the study design and subject assignment to experimental conditions. Parents were paid a $10 incentive for videotaping.

The parent-child interaction videotape involved the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent encouraged the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds. Taping continued for two minutes after the parent returned to the room.

The videotape of motor functioning followed a specific script. The motor script encouraged the child to perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

18 month posttest. Infants were posttested at 18 months corrected age and annually thereafter. The infants were administered the BDI; parents completed the

PSI, FILE, FACES III, FSS, FRS, a survey of the additional services received by the child in the last year, a report of child health during the last year, and a survey of demographic characteristics. Parents were paid $20 for completion of the evaluation.

The posttest data provides information regarding the child's developmental change in the first 18 months (and yearly thereafter), and the effect of intervention services upon the child's development.

30-month posttest. The second posttest occurred at 30 months corrected age. The BDI and the Stanford Binet Intelligence Test Screening Test (Thorndike, Hagon, & Sattler, 1986) were administered to the subjects. The Stanford-Binet Intelligence Scale measures general intellectual ability and was standardized for individuals from 2 to 18 years of age. The screening test consists of one subtest from each domain and includes the following subtests: vocabulary, pattern analysis, quantitative, and bead memory. Correlations reported in the Stanford Binet Technical Manual between the screening-test battery and the full battery range from .92 to .98. In addition to the child functioning measures completed at 30 months, the parent completed the PSI, FILE, FACES III, FSS, FRS, a survey of additional services received by the child in the last year, a report of child health during the last year, the survey of demographic characteristics, and the Carey Toddler Temperament Questionnaire. In addition, a videotape of parent-child interaction was completed. Parents were paid $25 for completion of the evaluation.

42-month posttest. The third posttest occurred at 42 months actual chronological age. The children were tested with the BDI and the Stanford Binet Screening test. They were also administered the Preschool Language Scale (Zimmerman, Steiner, & Evatt, 1969). The Preschool Language Scale is designed to evaluate language strengths and deficits in the areas of auditory comprehension and verbal ability. It also assesses articulation and was designed for children ages 18 months to 7 years, or children functioning within that age range. Parents were asked to complete the EIRI battery of family measures, the demographic, additional services, and child health surveys, and a parent-child interaction videotape. Parents were paid $35 for completing the testing procedures.

54-month posttest. The 54-month posttest included the BDI, the Stanford-Binet screening test, the PLS, the EIRI battery of family measures, the demographic, additional services, child health surveys, and a parent-child interaction videotape. In addition, further information was gathered regarding neuropsychological and behavioral functioning through assessment instruments that were not appropriate for younger children. Neuropsychological assessment provided information regarding not only areas of brain dysfunction, but attentional problems and learning disabilities. Included in the 54-month posttest were the Child Behavior Checklist (Achenbach, 1983), the Test of Visual Motor Integration (Beery, 1989), and the Draw-A-Man test (Harris, 1963).

The Child Behavior Checklist was standardized for children from 4 - 16 years of age. It was designed to identify child competencies and behavior problems and was completed by the parent. It is reported to have good psychometric properties and has been widely used in both clinical and research settings.

The Test of Visual Motor Integration (VMI) is a standardized assessment of the development of eye-hand coordination skills. The test is designed for children 4 - 17 years of age. The VMI has also been used widely in clinical and research settings and has been found to predict school success when used in conjunction with other assessments.

The Draw-a-Person test is a non-verbal test designed for children from 3 years 0 months to 15 years 11 months of age. The test provides an estimate of developmental level and has been revalidated as a measure of cognition in young children (Kifune, 1984). Parents were paid $35 for completing the 54-month assessment battery. The posttesting schedule and number of infants assessed appears below as Table 9.4.

Table 9.4

Testing Schedule for IVH Study

Time of Assessment	Number Assessed to Date
3 Months	58
18 Months	58
30 Months	49
42 Months	40
54 Months	21
66 Months	1

Results and Discussion

The purpose of the Salt Lake City IVH study was to compare the effectiveness of intervention begun early (at 3 months adjusted age) to intervention begun later (at 18 months adjusted age) for children with a history of perinatal intraventricular hemorrhage. The children were pretested when they were 3 months corrected age, and posttested at 18 months corrected age and yearly thereafter. The posttest analyses reported here included all children who received the 18- and 30-month posttest.

Comparability of Groups on Pretest Measures

Analysis of pretest comparability of the groups on family demographic characteristics, child medical characteristics, and child and family functioning were performed for (a) all subjects participating in the study, (b) those subjects posttested at 18 months CCA, (c) those subjects posttested at 30 months CCA, and (d) those subjects posttested at 42 months actual age. Analysis of family demographic characteristics (Table 9.5) indicated that of the 17 variables on which comparisons

Table 9.5
Comparability of Groups on Demographic Characteristics for Salt Lake City Age-At-Start Study

	All Active Subjects Enrolled and Included in Posttest #1 Analysis (18 months)								Subjects Included in Posttest #2 Analysis (30 month)								Subjects Included in Posttest #3 Analysis (42 month)							
	Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES^
● Age of child in months as of 7/1/90	21.1	(1.3)	28	21.3	(.8)	28	.55	.15	32.9	(1.6)	26	33.0	(0.9)	25	.75	.06	42.7	(1.2)	19	42.5	(.40)	21	.58	-.17
● Age of mother in years	27.1	(4.4)	28	29.2	(5.8)	28	.13	|.48|	28.0	(4.6)	26	30.1	(6.0)	25	.17	|.46|	28.5	(4.0)	19	28.4	(13.4)	21	.97	|.03|
● Age of father in years	29.2	(5.1)	28	31.6	(6.0)	27	.12	|.47|	29.9	(5.0)	26	32.9	(6.0)	24	.08	|.60|	30.1	(4.7)	19	31.0	(13.8)	20	.78	|.19|
● Percent Male*	50.0	------	28	43	------	30	.62	|.13|	50	------	26	44	------	25	.68	|.12|	42	------	19	43	------	21	.96	|.03|
● Years of education for^δ mother	13.1	(2.3)	28	13.2	(2.0)	30	.87	.04	13.2	(2.2)	26	13.0	(2.1)	25	.85	-.09	13.2	(2.2)	19	13.0	(2.1)	21	.82	-.09
● Years of education for^δ father	13.4	(2.3)	28	14.3	(2.1)	29	.10	.39	13.2	(2.3)	26	14.3	(2.1)	25	.09	.48	13.5	(2.3)	19	14.2	(2.2)	20	.32	.30
● Percent w/ both parents living at home	100	------	28	93	------	30		.13	100	------	26	92	------	25		.17	100	------	19	95	------	21		.15
● Percent of children* who are Caucasian	82	------	28	97	------	30	.08	-.48	81	------	26	96	------	25	.09	-.48	84	------	19	95	------	21	.27	-.35
● Hours per week mother^δ employed	9.6	(16.8)	28	10.2	(15.4)	30	88	|.04|	10.3	(17.2)	26	8.4	(14.0)	25	.67	|.11|	12.6	(19.2)	19	12.0	(17.1)	21	.92	|.03|
● Hours per week father^δ employed	42.3	(14.7)	25	42.0	(16.1)	26	.93	|.02|	43.8	(12.2)	23	44.3	(15.0)	21	.91	|.04|	43.8	(11.2)	16	42.8	(13.5)	18	.82	|.09|
● Percent of mothers* employed as technical managerial or above	25	------	28	10	------	30	12	-.40	27	------	26	12	------	25	.19	.38	26	------	19	14	------	21	.36	.30
● Percent of fathers* employed as technical managerial or above	21	------	28	45	------	29	.06	-.50	23	------	26	50	------	24	.05	-.57	26	------	19	45	------	20	.24	-.36
● Total household income[♣]	$24,179	($17,760)	28	$29,650	($17,307)	30	.24	.31	$25,000	($18,153)	26	$31,120	($18,121)	25	.23	.34	$25,921	($16,181)	19	$31,214	($18,626)	21	.35	.33
● Percent receiving^δ public assistance	24	------	28	23	------	30	.66	.12	27	------	26	24	------	25	.82	.06	32	------	19	24	------	21	.60	.17
● Percent of children*^δ in daycare ore than 5 hours per week	36	------	28	24	------	29	.35	.25	38	------	26	25	------	24	.32	.29	42	------	19	35	------	29	.66	.14
● Number of siblings^δ	1.2	(.96)	28	1.5	(1.68)	30	.37	.31	1.2	(1.0)	26	1.6	(1.8)	25	.27	|.40|	1.3	(1.0)	19	1.4	(1.7)	21	.88	.10
● Percent with English˙ as primary language	100	------	28	100	------	30		-.01	100	------	26	100	------	25	+	-.01	100	------	19	100	------	21	+	-.02

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^ Effect size (ES) is defined here as the difference between the groups (Early minus Delayed) on the x scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♣ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

˙ One of the groups has no variance

δ Some posttest information was used to arrive at these figures.

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were made using a significance level of .10, there was a statistically significant difference between the groups for three variables, including fathers education level, percent of fathers employed as technical managerial or above, and percent of children who were Caucasian. Given the many variables on which comparisons were made, it is not surprising that there was a statistically significant difference on one; when the data are considered in total, it appears that the groups were very comparable in terms of demographics. The slight advantage which may existed was in favor of the group which received early intervention.

A comparison of the infants' medical characteristics (see Table 9.6) indicated that at pretest, the groups were similar on all medical characteristics. Table 9.7 shows infant pretest scores on the BDI and family functioning measures.

When all of the subjects who were enrolled in the study and who were also included in Posttest #1, and those subjects included in Posttest #2, were compared at pretest on BDI scores, the groups were found to be similar on the personal/social, adaptive, and cognitive domains. The groups differed significantly at pretest on the motor and communication domains, and on the BDI Total score. The results of the pretest comparison on the BDI score for only those subjects included in Posttest #3 indicated significant differences between the groups on the cognitive domain. At pretest, the groups were found to be similar in terms of parenting stress as measured by the PSI.

Effects of Early Versus Delayed Intervention on Measures of Child Functioning

Analysis of covariance procedures were used to measure differences between groups on measures of child and family functioning following early intervention services to one group of infants and delayed intervention to the other group. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any

Table 9.6

Comparability of Groups on Demographic Characteristics for Salt Lake City Age-At-Start Study

	All Active Subjects Enrolled and Included in Posttest #1 Analysis (18 months)								Subjects Included in Posttest #2 Analysis (30 month)								Subjects Included in Posttest #3 Analysis (42 month)							
	Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention					Delayed Intervention			Early Intervention				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES
● Birthweight (grams)	1534	(681)	28	1302	(545)	30	.16	.34	1549	(705)	210	1296	(536)	25	.12	-.36	1516	(741)	19	1354	(600)	21	.45	-.22
● Grade of IVH* (% w/ Grade III or IV)	39	------	28	30	------	30	.47	.11	42	------	26	28	------	25	.30	.75	58	------	19	33	------	21	.13	.61
● Gestational Age (weeks)	30.8	(3.5)	28	29.4	(2.7)	30	.10	-.40	30.8	(3.7)	26	29.5	(2.7)	25	.15	-.35	30.7	(3.9)	19	30	(3.0)	21	.36	-.18
● 1-Minute Apgar	4.0	(2.5)	28	3.7	(2.4)	29	.63	-.12	4.0	(2.6)	26	3.9	(2.5)	24	.87	-.04	4.1	(2.5)	19	3.9	(2.6)	20	.81	-.08
● 5-Minute Apgar	6.1	(2.0)	28	6.2	(1.5)	29	.89	.05	6.0	(2.1)	26	6.2	(1.6)	24	.81	.10	5.8	(2.4)	19	6.0	(1.6)	20	.87	.08
● Apnea (%)*	57	------	28	67	------	30	.46	-.19	54	------	26	64	------	25	.47	-.20	58	------	19	57	------	21	.96	.02
● Seizures (%)*	11	------	28	13	------	30	.77	-.08	12	------	26	16	------	25	.65	-.13	16	------	19	19	------	21	.79	-.08
● Respiratory Distress* Syndrome (%)	7	------	28	13	------	30	.45	-.20	8	------	26	16	------	25	.37	-.25	5	------	19	14	------	21	.36	-.30
● Bronchopulmonary* Dysplasia (%)	61	------	28	70	------	30	.47	-.20	62	------	26	76	------	25	.28	-.31	63	------	19	71	------	21	.59	-.17
● Metabolic Acidosis (%)*	18	------	28	20	------	30	.84	-.05	15	------	26	16	------	25	.95	-.02	0	------	19	10	------	21	•	-.40
● Retinopathy of* Prematurity	25	------	28	33	------	30	.50	-.18	27	------	26	32	------	25	.70	-.11	32	------	19	29	------	21	.84	.06
● Hypertension (%)*	4	------	28	10	------	30	.34	-.75	4	------	26	8	------	25	.54	-.17	5	------	19	5	------	21	.94	.02
● # postnatal transfusions	8.2	(7.8)	28	10.6	(10.4)	30	.33	.31	8.7	(8.0)	26	11.6	(10.9)	25	.28	.36	10.1	(8.5)	19	12.0	(11.0)	21	.56	.22

* Statistical analyses for these variables were based on a *t*-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

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Table 9.7

Comparability of Groups on Pretest Measures for the Salt Lake City Age-At-Start Study

Variable	All Active Subjects Enrolled and Included in Posttest #1 Analysis (18 months)										Subjects Included in Posttest #2 Analysis (30 month)										Subjects Included in Posttest #3 Analysis (42 month)									
	Delayed Intervention				Early Intervention						Delayed Intervention				Early Intervention						Delayed Intervention				Early Intervention					
	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	ES	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	ES^	X̄	(SD)	%ile	n	X̄	(SD)	%ile	n	P Value	ES
● Age in months at pretest	3.4	(.74)		28	3.3	(.52)		30	.45	-.14	3.4	(.70)		26	3.3	(.54)		25	.42	-.14	3.2	(.54)		19	3.3	(.56)		21	.67	.19
● Battelle Developmental* Inventory (BDI)																														
Personal/Social	102	(54)		28	121	(51)		30	.16	.35	95	(47)		26	114	(51)		25	.18	.40	90	(52)		19	114	(43)		21	.12	.46
Adaptive Behavior	83	(49)		28	99	(43)		30	.19	.33	79	(45)		26	94	(45)		25	.22	.33	72	(50)		19	95	(43)		21	.12	.46
Motor	81	(26)		28	95	15)		30	.01	.54	79	(23)		26	94	(14)		25	.01	.65	82	(23)		19	94	(15)		21	.07	.52
Communication	78	(50)		28	106	(31)		30	.02	.56	74	(46)		26	107	(34)		25	.01	.72	75	(51)		19	114	(25)		21	.01	.76
Cognitive	74	(45)		28	88	(39)		39	.20	.31	74	(47)		26	86	(40)		25	.23	.26	76	(52)		19	101	(34)		21	.08	.48
TOTAL	83	(42)		28	104	(30)		30	.03	.50	80	(41)		26	100	(31)		25	.05	.49	78	(46)		19	104	(23)		21	.08	.57
● Parenting Stress' Index (PSI)																														
Child Related	106	(21)	67	22	101	(20)	57	24	.36	.24	107	(22)	70	20	102	(21)	60	19	.49	.23	107	(24)	70	13	99	(19)	50	15	.35	.33
Other Related	133	(30)	71	22	124	(19)	56	24	.28	.30	134	(30)	72	20	127	(18)	61	19	.37	.23	132	(32)	70	13	123	(18)	55	15	.36	.28
TOTAL	239	(41)	78	22	255	(35)	83	24	.22	.39	241	(41)	72	20	229	(35)	61	19	.33	.29	239	(46)	70	13	222	(33)	51	15	.28	.37

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the age equivalent (AGE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

' Statistical analyses and Effect Size (ES) estimates for PSI were based on raw scores where low raw scores and positive ESs are most desirable. For each of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals (see Appendix A for details). A low percentile score indicates low stress or a low number of stress-associated life events.

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pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. For example, number of days in NICU, pretest BDI receptive communication raw score, and pretest BDI Total raw score were used as covariates for 18-month communication raw scores.

In each analysis, the specific covariates used are indicated in the table. ANCOVA results are shown in Table 9.8. The analysis of data collected at 18 months CCA and 30 months CCA, 30 months actual age indicated that there were no statistically significant differences between groups on measures of child functioning.

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 9.9 presents the results of the ANCOVA comparisons of posttest measures of family functioning. Results of the ANCOVA indicated no significant differences between the early and delayed intervention groups on outcome measures of family functioning at either 18 months corrected age or 30 months corrected age. At 42 months, the groups were significantly different on the cohesion score of the FACES. These differences suggest that families in the delayed intervention group functioned more optimally in terms of family cohesion.

Table 9.8

Summary of ANCOVA's on Measures of Child Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

	Covariates[♣] In Order	Delayed Intervention				Early Intervention				ANCOVA F	P Value	ES[^]
		$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n			
18-MONTH ANALYSES												
Age in Months at Posttest	----------	18.7	(1.5)		28	18.4	(.8)		28	3.66	.001	-.20
Battelle Developmental[*] Inventory (BDI)												
Personal/Social	5,1	55.5	(12.2)	55.6	28	55.4	(15.4)	55.3	29	.01	.92	-.02
Adaptive Behavior	5,1,2	40.6	(9.0)	41.2	28	41.2	(9.3)	40.6	29	.08	.78	-.07
Motor	5,1	59.8	(16.7)	60.1	28	61.2	(15.6)	60.8	29	.03	.87	.04
Communication	5,2,1	28.7	(6.2)	29.1	28	29	(6.5)	28.6	29	.13	.72	-.08
Cognitive	5,1	22.1	(4.1)	22.2	28	22.0	(4.3)	21.8	29	.15	.70	-.10
TOTAL	5,1	206.7	(40.6)	207.9	28	208.7	(45.3)	208.7	29	.00	.98	.02
Rating of Child's Health[♦]	----------	1.7	(.46)		18	2.0	(.58)		22	1.56	.36	.65
30-MONTH ANALYSES												
Age in Months at Posttest	----------	30.7	(1.6)		26	30.6	(1.4)		25	1.29	.53	-.06
Battelle Developmental[*] Inventory (BDI)												
Personal/Social	1,5	83.9	(20.3)	84.3	26	88.2	(24.6)	87.8	24	.33	.54	.17
Adaptive Behavior	1,5	54.5	(12.9)	54.8	26	57.9	(16.7)	57.6	24	.59	.45	.22
Motor	1,5	78.2	(18.7)	78.9	26	81.0	(19.6)	80.2	24	.07	.79	.07
Communication	1,3,5	40.6	(9.4)	40.1	26	41.7	(10.9)	42.1	24	.49	.49	.21
Cognitive	2,4	29.1	(7.5)	29.7	26	29.8	(7.8)	29.3	24	.06	.81	-.05
TOTAL	1,5,2,3	286.4	(60.6)	287.3	26	298.6	(72.9)	297.8	24	.36	.55	.17
Rating of Child's Health[♦]	----------	1.8	(.59)		24	2.1	(.58)		24	1.02	.97	.51
42-MONTH ANALYSES												
Age in Months at Posttest	----------	42.1	(.85)		19	42.05	(1.20)		21	2.01	.141	-.05
Battelle Developmental[*] Inventory (BDI)												
Personal/Social	2,5	103.4	(25.5)	105.9	19	111.5	(21.1)	109.0	21	.23	.60	.12
Adaptive Behavior	5,2,4	67.6	(15.9)	68.2	19	72.2	(12.8)	71.7	21	.71	.41	.22
Motor	5,2	88.9	(23.0)	88.5	19	93.3	(13.9)	93.7	21	.68	.41	.23
Communication	5,2	53.7	(18.7)	54.5	19	58.7	(12.5)	57.9	21	.49	.49	.18
Cognitive	2,5	38.5	(11.3)	39.3	19	44.2	(9.6)	43.5	21	1.59	.22	.37
TOTAL	5,2	352.2	(86.0)	357.8	19	380.0	(55.5)	374.4	21	67	42	.19
Rating of Child's Health[♦]	----------	1.88	(.49)		19	2.05	(.51)		20	1.11	.85	.35

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[*] BDI Statistical Analyses for BDI scores were conducted using computed scores for each of the scale. Development Quotient (DQ) was obtained by dividing the "Age Equivalent" (AGE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[^] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[♣] Covariates: 1 = Battelle Raw Pretest Total Score; 2 = Battelle Raw pretest Receptive Communication Score;[•] 3 = Battelle Raw Pretest Motor Score; 4 = Number of Transfusions from NICU; 5 = Number of days in NICU.

[•] Variables for which there are pretest differences

[♦] Parents rated their child's health on a 3-point scale (1 = worse than peers; 2 = same as peers; 3 = better than peers)

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Table 9.9

Summary of ANCOVA's on Measures of Family Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

	Covariates♣ In Order	Delayed Intervention				Early Intervention				ANCOVA F	P Value	ES~
		$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n			
18-MONTH ANALYSES												
Parenting Stress Index#♦▲ (PSI)												
Child Related (range 47 to 235)	2	103.3	(12.1)	102.7	22	100.5	(15.6)	101.1	23	.17	.68	.13
Other Related (range 54 to 270)	5,1	130.2	(31.4)	128.9	22	121.9	(22.7)	123.3	23	.53	.47	.18
TOTAL (range 101 to 515)	3,4	222.0	(42.2)	218.8	22	222.4	(33.0)	225.7	23	.55	.46	.16
Family Adaptation and Cohesion Evaluation Scales*#♦ (FACES)												
Adaptation (range 0 to 26)	3,4	3.7	(4.1)	3.5	22	4.9	(4.8)	5.0	22	1.61	.21	-.37
Cohesion (range 0 to 30)	11	4.2	(3.4)	4.3	28	5.1	(6.3)	4.9	27	.16	.69	-.18
TOTAL (range 0 to 40)	2	11.2	(8.2)	11.0	22	11.8	(7.2)	12.0	22	.22	.64	-.12
Discrepancy	6	65.4	(8.7)	66.8	28	95.3	(152)	93.9	28	.84	.36	-.24
Family Resource Scale♦•§ (FRS)	6,2	121.9	(17.2)	123.5	22	131.3	(21.7)	129.6	23	1.27	.27	.35
Family Support Scale♦•§ (FSS)	5,6	29.3	(7.2)	29.0	28	31.6	(13.1)	31.9	27	1.05	.31	.40
Family Index of Life♦δ (FILE)	6,11	12.0	(6.3)	11.5	28	11.0	(6.8)	11.5	27	.00	.99	.00

(continued)

~ Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the $\bar{x}$ scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

# Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

* No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with children with disabilities).

▲ A low raw score and/or a low percentile score indicates lower stress level.

δ A low raw score and/or high percentile score indicates lower stress level, and a positive effect size is more desirable.

• Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of "0" is best and positive ESs indicate that the experimental group scored closer to "ideal."

♣ Covariates: 1 = Parenting Stress Index, Total; 2 = Parenting Stress Index, Child Related; 3 = Parenting Stress Index, other Related; 4 = Years of Mother's Education; 5 = Number of hours mother works; 6 = Income; 7 = Father's Age; 8 = Mother's Age; 9 = In daycare greater than 5 years per week; 10 = Father's degree; 11 = Years of Fathers Education; 12 = HOTEN

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Table 9.9 (continued)

Summary of ANCOVA's on Measures of Family Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

	Covariates[♣] In Order	Delayed Intervention				Early Intervention				ANCOVA F	P Value	ES[~]
		$\bar{X}$	(SD)	Adj. $\bar{X}$	n	$\bar{X}$	(SD)	Adj. $\bar{X}$	n			
30-MONTH ANALYSES												
Parenting Stress Index[#♦▲] (PSI)												
Child Related (range 47 to 235)	2,4,7,9	104.2	(17.6)	103.1	19	101.7	(22.2)	102.8	19	.00	.96	.02
Other Related (range 54 to 270)	3,8,9,7	128.3	(23.9)	126.5	19	121.7	(23.3)	123.5	19	.28	.60	.20
TOTAL (range 101 to 515)	1,7,11,9	232.4	(33.1)	231.0	19	223.4	(38.6)	224.9	19	.40	.53	.18
Family Adaptation and Cohesion Evaluation Scales[*#♦] (FACES)												
Adaptation (range 0 to 26)	8,10,11	5.9	(4.7)	5.9	24	4.0	(2.8)	4.1	22	2.58	.12	.39
Cohesion (range 0 to 30)	12,10,5,9	4.7	(3.1)	4.6	24	4.2	(3.1)	4.4	22	.04	.85	.06
TOTAL (range 0 to 40)	12,2,4,1, 10,6,11	10.4	(9.0)	10.5	18	9.4	(4.7)	9.4	18	.25	.62	.12
Discrepancy (range 0 to 80)	10,12,3	65.4	(9.7)	65.8	18	64.8	(7.1)	64.4	18	.33	.57	.14
Family Resource Scale[♦•§] (FRS)	6,9,8	122.1	(19.5)	125.0	24					.31	.58	.16
Family Support Scale[♦•§] (FSS)	10,12	30.3	(10.1)	31.0	24	29.8	(11.2)	29.2	23	.37	.54	-.18
Family Index of Life[♦δ] (FILE)	2	11.0	(7.7)	10.8	19	9.1	(5.5)	9.4	19	.46	.50	.18

(continued)

[~] Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

[*] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with children with disabilities).

[▲] A low raw score and/or a low percentile score indicates lower stress level.

[δ] A low raw score and/or high percentile score indicates lower stress level, and a positive effect size is more desirable.

[•] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of "0" is best and positive ESs indicate that the experimental group scored closer to "ideal."

[♣] Covariates: 1 = Parenting Stress Index, Total; 2 = Parenting Stress Index, Child Related; 3 = Parenting Stress Index, other Related; 4 = Years of Mother's Education; 5 = Number of hours mother works; 6 = Income; 7 = Father's Age; 8 = Mother's Age; 9 = In daycare greater than 5 years per week; 10 = Father's degree; 11 = Years of Fathers Education; 12 = HOTEN

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Table 9.9 (continued)

Summary of ANCOVA's on Measures of Family Functioning for Alternative Intervention Groups for SLC/IVH Age-at-Start Study

		Delayed Intervention				Early Intervention						
	Covariates♣ In Order	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES
30-MONTH ANALYSES												
Parenting Stress Index#▲ (PSI)												
Child Related (range 47 to 235)	1,11,12,3	103.9	(17.1)	104.0	13	101.7	(19.0)	101.7	15	.16	.70	.14
Other Related (range 54 to 270)	3,12,8	125.2	(22.1)	121.5	13	119.9	(24.4)	123.6	15	.12	.73	-.10
TOTAL (range 101 to 515)	1,12,3, 11,7,10	229.2	(36.0)	223.4	13	221.6	(40.6)	227.4	15	.12	.73	-.13
Family Adaptation and*# Cohesion Evaluation Scales (FACES)												
Adaptation (range 0 to 26)	5,7,12,3 2,4,6	3.5	(2.4)	3.6	13	2.7	(2.6)	2.6	15	.93	.34	.42
Cohesion (range 0 to 30)	12,10,7, 11,9,1	2.9	(2.0)	2.5	15	3.8	(2.4)	4.1	18	4.42	.05	-.80
TOTAL (range 0 to 40)	12,5	10.8	(8.3)	10.5	16	6.0	(5.3)	6.2	21	3.73	.06	.52
Discrepancy (range 0 to 80)	12,4,5	65.5	(3.7)	65.6	16	66.2	(6.4)	66.1	21	.11	.74	-.14
Family Resource Scale* (FRS)	6,2,3,9	126.2	(17.4)	127.3	13	126.2	(16.0)	125.1	15	.22	.65	-.13
Family Support Scale* (FSS)	2,6,8	28.2	(10.3)	28.7	13	34.3	(9.6)	33.7	15	1.79	.19	.49
Family Index of Life♦δ (FILE)	12,2,6	9.0	(5.1)	8.3	13	8.8	(5.5)	9.5	15	.52	.48	-.24

Effect Size (ES) is defined here as the difference between the groups (Early minus Delayed) on the X scores, divided by the standard deviation of the Basic Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

# Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

* No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with children with disabilities).

▲ A low raw score and/or a low percentile score indicates lower stress level.

δ A low raw score and/or high percentile score indicates lower stress level, and a positive effect size is more desirable.

* Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of "0" is best and positive ESs indicate that the experimental group scored closer to "ideal."

♣ Covariates: 1 = Parenting Stress Index, Total; 2 = Parenting Stress Index, Child Related; 3 = Parenting Stress Index, other Related; 4 = Years of Mother's Education; 5 = Number of hours mother works; 6 = Income; 7 = Father's Age; 8 = Mother's Age; 9 = In daycare greater than 5 years per week; 10 = Father's degree; 11 = Years of Fathers Education; 12 = HOTEN

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Conclusions

The Salt Lake IVH study reached maximum enrollment in 1989. All subjects were pretested at 3 months CCA and received Posttest #1 at 18 months CCA. Results of the Posttest #1 analysis are complete. However, all subjects who were pretested have not yet received Posttest #2 at 30 months CCA and Posttest #3 at 42 months actual age. Therefore, the results presented for Posttests #2 and #3 are preliminary.

The results of the statistical analysis of the 18-, 30-, and 42-month posttest data indicated that there were no significant differences between groups on the measures of child functioning following intervention begun at 3 months vs intervention begun at 18 months corrected chronological age. Analysis of the data collected on family functioning revealed only one statistically significant posttest difference. At the 42-month posttest, families in the delayed intervention group were found to be functioning more optimally with regard to family cohesion. This isolated difference may suggest either a treatment effect, or a spurious relationship. Collection and analysis of data from the families in the sample who are not yet 42 months of age will clarify this issue.

The preliminary conclusion from this study, however, was that to this date the earlier intervention has not resulted in greater benefits to either children or families. Those children who received earlier intervention did not appear to do substantially better than children who received the later intervention.

The results of the current study present a contrast to results reported by Als et al. (1986), Resnick et al. (1987; 1988), who found significant differences favoring infants receiving early intervention services. This study did, however, offer preliminary support and can be better compared to the findings of Piper et al. (1986) and Palmer et al. (1988), who concluded that early motor therapy did not substantially improve the developmental outcome of high-risk infants. It is possible that focusing early intervention efforts on sensory motor development is less effective than addressing more general developmental issues. It is also possible that differences between treatment groups will not be apparent until the subjects in this study are older. For example, Raugh et al. (1988) found that significant differences between experimental and control groups did not appear until 36 and 48 months, as did the Infant Health and Development Study (1990). Bennett (1987) reported that some less obvious disabilities were not apparent in children biologically at-risk for disabilities until they reached school age.

Issues related to the intensity and comprehensiveness of the intervention also need to be considered. The studies which did report significant findings also described the early interventions as occurring with greater frequency. In Resnick's (1987; 1988) studies, children were seen twice daily for three months, and then twice monthly until the child became two years of age. The Infant Health and Development Program reported weekly visits for the first year, and bi-monthly visits until the child became three years of age. It is possible that the individualized intervention described in the present study lacked the intensity to result in statistically significant differences. Resnick et al. (1987; 1988) also described a parent support component which was central to the intervention. While there is little doubt that parent support occurred in the present study, it was not a focus of the intervention. It is possible that focusing early intervention on the initial support needs of the parents in addition to the developmental needs of child and infant would produce more favorable results.

NEW ORLEANS, LOUISIANA IVH/VERY-LOW-BIRTHWEIGHT PROJECT

Project #10

COMPARISON: Grades III and IV Intraventricular Hemorrhage (IVH) or Very-Low-Birthweight Infants -- Treatment vs. No Treatment

LOCAL CONTACT PERSON: David Slade, Ph.D.

EIRI COORDINATOR: Lee Huntington, Ph.D.

LOCATION: New Orleans, Louisiana

DATE OF REPORT: 4-10-1991

Rationale for Study

One of the major determinants of infant mortality is low birthweight (LBW). In the USA, 6.8% of all newborn babies are LBW (weighing 2500 g or less at birth), and about 1.2% are very-low birthweight (VLBW) (weighing 1500 g or less at birth). This amounts to approximately 225,000 low-birthweight infants per year (National Center for Health Statistics, 1989).

Forty percent of low birthweight infants (or approximately 90,000 infants) suffer periventricular-intraventricular hemorrhages (PVH-IVH) within 72 hours of birth. These hemorrhages produce abnormal bleeding from cranial capillaries and result in different degrees of neurological damage based upon the severity of the hemorrhage (Volpe, 1981). Brain-imaging procedures such as real-time ultrasonography and computed tomography (CT) scanning are used to make a positive identification of IVH and to classify the hemorrhage into one of four grades of severity, with Grade I IVH the most mild form of hemorrhage, and Grade IV the most severe (Papile, Burstein, Burstein, & Koffler, 1978). Dramatic clinical symptoms such as seizures, loss of muscle tonus, cessation of breathing, and unreactive pupils, may mark the onset of IVH; however, at times IVH is clinically silent (Tarby & Volpe, 1982). The importance of PVH-IVH as a major health problem is underscored by the following statistics (Volpe, 1987):

For each 1,000 LBW infants born--

- 400 suffer PVH-IVH
- 100 of the 400 (25%) die immediately
- 85 of the remaining 300 (28%) suffer major neuropsychological impairment

Information as to the future developmental progress of PVH-IVH survivors is limited and controversial (Hynd, Harloge, & Noonan, 1984). Williamson, Desmond, Wilson, Andrew, and Garcia-Prats (1982) found that 29% of IVH Grade I and II LBW infants exhibited moderate disabilities by the age of 3, whereas Papile, Munsick-Bruno, and Schaefer (1983) found that only 15% of such children could be diagnosed as having these disabilities. Both Papile et al. (1983) and Williamson et al. (1982) found that up to 80% of premature LBW survivors who experienced Grade III or IV IVH demonstrated moderate to severe disabilities, such as cerebral palsy, by the third year of life. Finally, Sostek et al. (1987) demonstrated that the severity of IVH did not predict the infant's developmental progress at 2-years of age, however 40% of the infants in that study showed significant delays at 2-years.

Although there is a fair amount of research on interventions for premature low birthweight babies (see Bennett, 1987; Casto et al., 1987; Cornell & Gottfried, 1976; Klaus & Kennell, 1982; Masi, 1979; Ramey et al., 1984; for reviews), most have focused on in-hospital stimulation or parent training as opposed to a comprehensive intervention, and most have excluded children who have suffered major neurological insults such as IVH.

Five recent studies have included low birthweight infants with medical complications. For example, Als et al. (1986) studied 16 low birthweight infants with bronchopulmonary dysplasia. Experimental group infants received a program designed to reduce excessive NICU stimulation while control group infants received the regular NICU regimen. Experimental group infants performed significantly higher on the Bayley scales at 9 months, but no longer-term follow-up data is available. Helders (1989) designed a similar stimulation program for very low birthweight infants under 1500 g who had no medical complications. He followed very closely the intervention program of Als et al. (1986). He found short-term effects of the same magnitude as Als et al., but when he collected longer-term follow-up data, he concluded that the intervention program actually had a deleterious effect on the experimental group. His study underscores the importance of collecting longitudinal data over a longer period of time. Resnick et al. (1988) studied 221 infants with birthweight lower than 1800 g. The 107 infants in the treatment group received developmental interventions in the nursery, followed by home visits until the infants reached 12 months adjusted age. Experimental group infants performed significantly higher on the Bayley Mental Scale and the Greenspan-Lieberman Observation System (GLOS). At two year follow-up, 19 experimental group infants and 22 control group infants were assessed, and the experimental group retained its advantages.

Overview of Study

A major issue in the study of early intervention in general is the effect of the intensity of treatment which the infants receive. The issue of intensity needs to be examined with particular care in infants who are "at-risk" for developmental problems because of severe medical complications. Because the nature of "risk" is probabilistic, it is a given that some if not many of the infants will improve and show little or no deficits without any intervention. If 60% (according to recent estimates) of the infants who suffer Grade III or IV IVH show only subtle problems later, then the effects of the intervention must be large enough to be detected despite the improvement found following the natural course of the complication.

Thus, examination of intensity requires that the treatments be sufficiently different to maximize the possibility of detecting the effects of the intervention.

The previous level of service to medically fragile infants in the geographic area of this study consisted of only medical follow-up. The follow-up program examined each infant at 3 month intervals and made referrals to a variety of specialty clinics, but little organized effort was made to ensure that parents followed-through on the referrals. This level of service ensured that most medically fragile infants in the area did not receive intervention services until they developed major disabilities or were three years of age and qualified for preschool special education programs. Because the typical level of service was so sparse, an intervention program was developed which could be compared in a treatment-no treatment design. Briefly, this intervention program consisted of 1) in hospital recruitment and transition into the intervention program. 2) weekly home visits by members of a transdisciplinary team, and 3) an optional parent group meeting once a month. Children assigned to the non-intervention group continued to receive the standard level of treatment in the community.

Methods

This study was conducted in cooperation with the Community Action for Parental Success (CAPS) program at Louisiana State University Medical Center. CAPS provided services through a collection of community-based agencies for minority, low income, and infants with disabilities. Services were offered in three modules: (1) In the hospital, while the infant was in the neonatal intensive care unit; (2) at home, once the child was released from the hospital; and (3) at a center for parent/child intervention, when the infant was older and medically stable. The design of this program differs from previous services in that intervention began at birth and was provided in a transdisciplinary framework, infants were seen weekly, and referral to other services was immediate, with help accessing those services provided by the intervention team.

Full-time direct service staff for CAPS consisted of a Program Coordinator, Occupational Therapist, and Speech Pathologist/Infant Specialist. Part-time direct service staff included a nurse, nurse practitioner, paraprofessional home-visitor, and a social worker.

Subjects

Thirty-two infants were enrolled in this study. Of these, 20 have received a one-year posttest. The large attrition for this study is attributable to the population that was being served. The subjects were primarily low-SES, inner-city residents. Maintaining this population's participation in a research program is extremely difficult. Those subjects who were enrolled in the intervention group were easier to keep track of because of the weekly scheduling of visits. Of the 16 intervention group subjects who were actively enrolled on October 1, 1989 when the intervention portion of the project was terminated, 13 (81%) received a first posttest. The no intervention group subjects were more difficult to keep in touch with. Of the 14 that were actively enrolled in the program in October 1989, only 7 were available for posttesting.

Subjects included in this study were either diagnosed by ultrasound as having experienced periventricular-intraventricular hemorrhage or were born with a birthweight lower than 1000 g. Subject recruitment closed in October 1988. The current sample is composed of 90% Black and 10% Caucasian infants from both urban and rural areas of the greater New Orleans metropolitan area.

Recruitment. Infants qualified for participation in the research if they had been a patient in the NICU at Charity Hospital or Tulane Medical Center, if they had experienced perinatal intraventricular hemorrhage (IVH) of Grades III or IV severity, had a birthweight of less than 1000 g, and/or if they resided in the catchment area for treatment. Subjects who met the inclusion criteria were identified while in the NICU. Parents of eligible infants were contacted while their infant was still in the NICU; telephone contact was made shortly after discharge. For each infant who met the study criteria, parents were required to indicate willingness to participate in either the experimental or the control conditions depending upon where random assignment placed them.

Assignment to groups. All assignment to groups was performed by the site coordinator at the Early Intervention Research Institute (EIRI). For the purposes of this study, it was necessary to ensure that the distribution of grades of IVH and birthweights be comparable between the treatment and control groups. The treatment and control conditions were thus stratified by severity of IVH (Grades III or IV) and birthweight (under 1000 g or over 1000 g) yielding a 2 (Grade; III or IV) x 2 (Birthweight; under 1000 g or over 1000 g) design. Imposing this stratification scheme on the treatment and control group yielded a 2 x 2 x 2 design. Those infants who did not suffer IVH, but were below 1000 grams, were stratified on the number of days that they were on a ventilator to ensure the comparability of the groups. Before any infants were assigned, a random number generator indicated the order of assignment to treatment or control for each sequence of four children fitting a stratification cell. Thus, the four cells differed on the order in which children with those characteristics were assigned to the treatment or control group. After four infants with particular stratification characteristics were assigned, the random number generator was used to designate another assignment order for the next four infants in that cell. Parents were informed of their infant's assignment after they gave approval to participate in the study.

Demographic characteristics. Demographic information on the subjects and their families was gathered from a questionnaire and from medical discharge summaries. All of the children were from families who resided in the metropolitan area of New

Orleans, Louisiana. The demographic characteristics of the sample, divided by groups is represented in Table 10.1. The left half of the table represents the demographic

Table 10.1

Comparability of Groups on Demographic Characteristics for LSU Medically Fragile

	Active Subjects Enrolled by July 1, 1989							**Subjects in First Posttest Analyses**						
	No Intervention			Early Intervention				No Intervention			Early Intervention			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
● Age of child in months as of 10/30/90	35.3	(7.3)	14	36.7	(7.2)	16	.67	39.5	(6.5)	7	35.9	(7.2)	13	.29
● Age of mother in years	27.1	(8.2)	12	25.3	(5.8)	13	.53	26.0	(13.00	7	26.1	(5.6)	11	.80
● Age of father in years	28.9	(5.2)	10	28.0	(4.4)	12	.67	29.8	(4.8)	6	28.7	(4.2)	10	.64
● Percent male*	43		14	62		16	.30	57		7	54		13	.89
● Percent w/Birthweight < 1000 g	7		13	62		16	.66	83		6	58		12	.30
● Years of education for mother	11.2	(1.5)	14	10.5	(2.1)	15	.33	12.1	(.7)	7	11.7	(2.3)	13	.52
● Years of education for father	11.8	(1.3)	11	12.4	(2.0)	10	.44	12.3	(1.4)	6	13.0	(1.8)	10	.41
● Percent with both* parents living at home	42		12	33		15	.67	71		7	38		13	.17
● Percent of children* who are Caucasian	7		14	13		15	.60	17		6	9		11	.67
● Hours per week mother employed	6.8	(15.2)	11	0	(0)	13	.17	5.0	(13.2)	7	2.7	(9.7)	13	.69
● Hours per week father employed	25.0	(22.9)	5	30.0	(18.6)	8	.67	31.2	(20.9)	4	29.4	(18.0)	8	.88
● Percent of mothers* employed as technical/ managerial or above	0		11	0		15	1.00	28		7	23		13	.88
● Percent of fathers* employed as technical/ managerial or above	0		4	12.5		8	.67	0		2	0		4	.70
● Total household income	$5,500	($4,194)	12	$10,000	($7,786)	13	.09	$5,400	($4,588)	5	$8,550	($3,996)	10	.19
● Percent receiving* public assistance	85		13	63		16	.20	86		7	61		13	.24
● Percent with mother* as primary caregiver	64		14	69		16	.80	100		7	100		13	.00
● Percent of children in daycare more than 5 hours per week	9		11	0		16	.85	7		7	0		12	.33
● Number of siblings	1.8	(2.9)	12	1.1	(.9)	16	.44	.4	(.8)	7	.8	(.7)	13	.36
● Percent with English* as primary language	100		10	100		13	1.00	100		4	100		10	1.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored as "0."

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data for the overall sample of infants that were recruited; the right side represents the data for those infants who received a first posttest. A larger proportion of single parent than two parent families were represented in the study. The enrolled families were predominantly low income and included some single adolescent mothers. The pattern of the data for the reduced number of infants who received the first posttest is similar to that for the overall group that was enrolled. The reduced group appears demographically comparable to the overall group.

Intervention Programs

The comparison for this study is between a group of infants who receive the medical follow-up program offered by the hospital and a group of infants who receive an organized early intervention program conducted by the Human Development Center.

No Intervention

The comparison group for this study consisted of infants who received the typical level of services in the community. These services consisted of the medical follow-up program described in the introduction. Because these families did not have routine monthly contact with the intervention staff they were contacted approximately every three months by the coordinator of the intervention program. The families were queried about their child's health, and reminded that they would be asked to return for later evaluation.

Expanded Intervention Program

The intervention package for this research project consisted of select educational procedures which have been used routinely in a number of settings. The intervention package consisted of three components: hospital-based, home-based, and center-based.

Hospital-based component. The hospital-based phase took place at Charity Hospital and Tulane Medical Center Hospital. The purpose of this phase was to provide families of the experimental group with early contact with members of the intervention staff, to reinforce teaching conducted by hospital staff, and to provide information on accessing appropriate community services such as Handicapped Children's Services. The Brazelton Neonatal Behavioral Assessment Scale (NBAS) was used to develop an individualized description of the infant to be used for parent training. For example, if an infant showed low autonomic stability on the NBAS, the interventionist would plan ways to work with the mother on soothing and not overstimulating the infant. The NBAS was administered by the Project Nurse who was certified by staff from Boston Children's Hospital in the administration of the NBAS.

Home-based component. The second phase of the project began after NICU discharge, and consisted of home-based early intervention conducted cooperatively with an existing social service agency home-based parent training program for low-income mothers. The purpose of this phase of the program was to provide the infant's family with follow-up training on the proper care and handling of the infant. The infant was assessed, and an Individual Family Service Plan (IFSP) was developed in cooperation with the parents. Treatment objectives were determined in the areas of the infant's and family's greatest needs, but typically included objectives from the motor, self-help, receptive language, and social-emotional areas. The treatment program was delivered by the parents.

Individual family and child activities were designed to be integrated into the normal daily activities of the families. The four curriculum domains were compatible with routine daily activities such as feeding, dressing, and playing. Traditional developmental domains such as communication, cognitive, and gross and fine motor, and therapy techniques such as positioning and handling, were integrated into these routine activities throughout each of the three phases.

The primary interventionists, in addition to the parents, were a transdisciplinary team, with one member of the team assigned as case manager for each infant and family enrolled in the intervention. The other members of the team provided regular input on family and child progress, and consulted in their areas of specialty when needed. Each family was scheduled for a weekly one-hour home visit. Simple, practical programs were left with the principal caregivers each week, and performance was monitored weekly through an observation checklist.

Center-based component. The third phase of the intervention consisted of an optional center-based early intervention program conducted with the Urban League Parent/Child Center program. This program consisted of twice monthly parent group meetings conducted by a social worker and devoted to topics such as nutrition and childrearing.

Each of the intervention phases was driven by an Individualized Family Service Plan which was developed by the transdisciplinary team. One of the full-time staff was designated case manager. The case manager could, therefore, have been an occupational therapist, speech pathologist, infant specialist, or social worker. Representatives from each of the collaborating agencies were involved in the development of initial and follow-up IFSP goals, objectives, and activities. The case manager was responsible for assuring that direct service as well as referral objectives were met.

Treatment verification. A number of procedure's were developed to verify that treatment was being implemented as intended. For example, the intervention team recorded all home visits and telephone contacts with the family using a cumulative Monthly Contact Summary Sheet. Cancellations and hospitalizations were also noted. The data for the past year indicate that the infants in the intervention have received an average of 68% of the scheduled weekly home visits, accounting for 2.7 hours per month working at home with the interventionist. While 68% at first sounds low, the circumstances of the population who are receiving services must be considered. The families are mostly inner-city, low-income families, often single parents, with an average education of less than high school level. Maintaining these families' interest and participation in the intervention program is difficult at best. Other providers of service to similar populations have communicated difficulty maintaining even 50% participation (Tiffany Field, personal communication)

As a measure of the time that parents spent implementing the intervention, the interventionist elicited from parents an estimate of the amount of time per week that was spent with the child in activities that were recommended by the therapist. Parents reported an average of 2.25 hours per week, ranging from .33 to 3.75 hours. In addition, the interventionist rated their impression of the accuracy of the parent's report on a 3-point scale, with 1 being not accurate to 3 being very accurate. Analysis of these data indicate that the interventionists' ratings of the parents averaged 2.1, indicating that the interventionists considered the parents fairly accurate in their reports of the time spent working with their children.

Formal site reviews have been conducted periodically since the intervention program began. Site review visits were conducted in October 1987, March 1988, and August 1989. The purpose of these reviews was to collect information about the nature and quality of early intervention services being delivered. The site reviews were conducted according to the treatment verification process described in the Treatment Verification Handbook for Research Sites (EIRI, 1987), according to the procedures described in the Guide for Site Reviews of EIRI Research Sites, which is found in Appendix A of the handbook. This research site rated very highly on all criteria of the site review. Especially impressive were their procedures for Individual Family Service Plan Development, and their coordination of IFSPs and ongoing lesson planning. Dr. Tiffany Field accompanied the most recent visit as an outside reviewer. Dr. Field was selected because of her vast experience with interventions for medically fragile infants. Dr. Field spoke highly of the skills of the home interventionist whom she accompanied on a home visit.

Cost of the early intervention program. The cost per child for the 18 children receiving services in 1988-89 was calculated based on the ingredients approach and is presented on Table 10.2. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as

Table 10.2

Cost of One Year of Intervention per Child for LSU-IVH Site

Resources	Cost per Child (n=18)
1. **UNDISCOUNTED**	
Agency Resources	
Direct services	$ 3,584
Administration	
program	648
university	592
Occupancy	157
Equipment	77
Travel	94
Materials/supplies	88
Telephone	39
Miscellaneous	12
SUBTOTAL	**$ 5,291**
Contributed Resources	
Parent Time	1,324
TOTAL	***$ 6,615***
2. **DISCOUNTED (3%)**	
Subtotal	$ 5,265
Total	6,583
3. **DISCOUNTED (5%)**	
Subtotal	$ 5,833
Total	7,293

Totals may not add up due to rounding errors contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Costs were calculated for the intervention only; medical costs associated with IVH infants have been calculated for the Salt Lake City and South Carolina IVH studies and are available on request.

Resources used for the intervention include direct service and administrative personnel, university administration overhead, parent time, occupancy, equipment, travel, materials and supplies, telephone, and miscellaneous expenses.

Personnel costs are based on the salary and benefits for 2 case managers, a speech therapist, a social worker, and administrative staff (the director and a secretary) according to the percentage of FTE worked on the intervention project. In addition, neurological consultation services were purchased on a contractual basis throughout the year. Consultation costs were based on the proportion of time applied to direct service. University administration overhead was calculated using the university's indirect rate of 12.6% for general, departmental, and sponsored projects administration. Because this program relies heavily on parent time during home visits with professionals and also to learn and apply intervention techniques with their children, the value of parent time was included. The opportunity cost of parent time is based on the average hourly wage rate for full time work plus benefits for women in the U.S., $9/hour. Parents in the study spent an average of 30 hours per year in home visits with a program professional, and 108 hours working at home with their child. Occupancy charges were calculated based on the approximate cost of office leasing in the area according to local realtors, $9 per square foot. This includes maintenance, utilities (except telephone), and insurance. The project used 294 square feet this year (pro-rated according to FTE). Equipment costs were calculated by taking inventory of all office equipment and furniture, assigning a market replacement value to each item, annualizing the cost accounting for interest and depreciation, and prorating cost according to FTE worked on the project. Travel costs are based on case managers' mileage records for home visits and one trip per family to the center at $15 per trip. Finally, the cost of telephone and materials and supplies are based on annual project expenditures on these items. Further economic analyses, comparing the cost with benefits of the project, are pending.

Data Collection

Data were collected for this project to determine the effect of early intervention upon the child and the family. The assessment instruments were chosen to provide consistency of data collection between sites. However, some assessment instruments were chosen for this project to assess child and family variables unique to early intervention with infants suffering Grade III and IV IVH.

Recruitment, training, and monitoring of diagnosticians. Four local diagnosticians were trained to administer the pre- and posttest measures. The diagnosticians had master's degrees. Testing was scheduled directly with the diagnostician by the site coordinator. Shadow scoring of 10% of test administrations was conducted by another trained diagnostician. Interrater reliability data reveal an average coefficient of .88.

Pretesting. At 3 months corrected age (prematurity corrected to 40 weeks plus 3 months) all infants were tested with the BDI, the Movement Assessment of Infants (MAI), and a neurological assessment. The parents complete the Parenting Stress Index (PSI), a measure of the stress perceived by the parents, the Family Support Scale (FSS), a measure of the number of sources of support available, the Family Resource Scale (FRS), a measure of the adequacy of resources available, the Family Inventory of Life Events and Changes (FILE), which tallys the stress producing events of the past year, and the Family Adaptability and Cohesion Evaluation Scales (FACES III), which measures the cohesiveness and adaptability of the family system. The BDI was administered by a trained diagnostician who was unaware of the infant's group assignment. Test and questionnaire protocols were sent to the site coordinator for scoring and placement in a data file. A duplicate set of the data was sent to EIRI. Parents were paid $45 for their time in completing the evaluation session. The pretest assessment battery provides information about the child's early developmental status and neurological functioning. In addition, family measures provide information on family reaction to the newborn, parent stress, and family support systems.

Posttesting. Posttesting occurred at 12 months corrected age and annually thereafter. The posttest battery was administered by a diagnostician who was "blind" to the subject's group assignment. The child was given the BDI, the MAI, and a follow-up neurological examination; the parent again completed the PSI, FILE, FACES III, FSS, FRS. Parents also completed a survey of additional services received by the child in the last year, a report of child health during the last year, and a parent socioeconomic survey. Parents were paid $35 for completion of the evaluation. Additional measures taken at 12-months corrected age were videotapes of mother-infant interaction and one of motor development completed by a trained child development specialist or licensed physical therapist. Parents were paid $10 as an incentive.

The videotape of motor functioning followed a specific script. The motor script had the child perform the following behaviors (based upon the child's level of motor development): reaching and grasping from a supine position, rolling over and reaching and grasping from a prone position, creeping and crawling, sitting and reaching, pulling self up to stand, walking, and squatting to pick up a toy.

The parent-child interaction videotape recorded the parent and child in play activities. In the first section, the mother and child played together for 15 minutes "as they would at home." Then for one minute the parent was instructed to encourage the child to put the toys away. For the next two minutes, the parent read to the child. Then the parent left the room for 45 seconds, and taping continued for two minutes after the parent returned to the room.

Results and Discussion

The purpose of this study is to examine the effe_ts of a family and child directed early intervention program. Eighteen of the subjects had reached the age of first posttesting, and two had received their second posttest. Thus, the data analyses for this report examined the initial comparability of the groups at pretest and the measures of child and family functioning at the first posttest.

Initial Comparability of Groups

Table 10.3 represents the comparison of pretest measures for intervention and control groups on the child functioning and family measures. The left half of the table represents the data for all subjects currently enrolled in the study. The right half of the table represents the data for those subjects who have received their first posttest as of September 1, 1990. There were differences between the groups on the FRS and FILE pretest measures. These differences favored the control group. The lack of between groups differences on the demographic characteristics,

Table 10.3

LSU-IVH Treatment - No Treatment Study Comparability of Groups on Pretest Measures

	Active Subjects Enrolled by July 1, 1989							Subjects Included in First Posttest Analyses								
	No Intervention			Early Intervention				No Intervention			Early Intervention					
Variables	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANOVA F	p Value	ES[**]
● Age in months at pretest	3.8	(2.2)	14	3.5	(1.2)	15	.62	4.1	(1.7)	7	3.5	(1.3)	13	.58	.56	.35
● Battelle Developmental[*] Inventory (BDI)																
DQs for:																
Personal/Social	92.5	(34.2)	12	77.6	(36.9)	15	.29	83.3	(41.2)	6	83.8	(33.6)	12	.00	.98	.01
Adaptive Behavior	76.5	(40.7)	12	76.9	(39.5)	15	.98	75.0	(50.8)	6	94.4	(35.1)	12	.92	.35	.38
Motor	77.5	(26.7)	12	78.8	(27.6)	15	.90	72.2	(27.0)	6	88.9	(26.5)	12	1.56	.23	.62
Communication	65.3	(39.5)	12	59.4	(37.7)	15	.70	72.5	(39.7)	6	62.8	(35.7)	12	.28	.61	-.24
Cognitive	57.5	(35.0)	12	60.0	(35.7)	15	.86	51.1	(36.9)	6	55.8	(32.2)	12	.08	.78	.13
TOTAL	81.0	(33.1)	12	73.9	(33.8)	15	.59	83.3	(41.2)	6	83.8	(30.4)	12	.00	.98	.01
● Parenting Stress Index[♦] (PSI)																
Child Related	110.0	(17.0)	14	113.0	(14.0)	16	.55	117.0	(22.0)	7	119.1	(14.5)	13	.04	.81	-.09
Other Related	115.0	(21.0)	14	122.0	(22.0)	16	.43	112.8	(28.4)	7	129.6	(20.3)	13	1.69	.16	-.60
TOTAL	225.0	(32.0)	14	235.0	(33.0)	16	.42	229.8	(44.4)	7	248.7	(31.5)	13	1.14	.30	-.43
● Family Adaptation and[♦] Cohesion Evaluation Scales (FACES)																
Adaptation	5.4	(3.5)	13	6.1	(2.9)	16	.53	6.9	(4.4)	7	6.3	(2.7)	13	.11	.79	.14
Cohesion	4.3	(2.6)	13	5.5	(2.9)	16	.28	4.8	(1.5)	7	5.5	(3.0)	13	.25	.62	-.46
Discrepancy	10.1	(10.4)	13	11.5	(7.5)	16	.67	11.5	(12.8)	7	13.6	(6.7)	13	.23	.64	-.16
TOTAL	7.1	(3.8)	13	8.8	(2.4)	16	.16	8.8	(3.4)	7	9.0	(2.1)	13	.01	.91	-.06
● Family Resource Scale (FRS)	119.1	(13.8)	14	108.3	(13.6)	16	.04	121.3	(17.7)	7	107.8	(13.7)	13	3.31	.09	-.76
● Family Support Scale (FSS)	24.0	(13.4)	14	25.9	(9.9)	16	.66	25.7	(16.9)	7	23.5	(8.8)	13	.14	.71	-.13
● Family Index of Life[♦] Events (FILE)	7.2	(5.5)	13	9.9	(7.6)	16	.28	4.3	(3.9)	7	11.5	(9.1)	13	3.31	.09	-1.85

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[♦] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[**] Effect Size (ES) is defined here as the difference between the groups (early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; Cohen, 1977 for a general discussion of the concept of Effect Size).

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suggest that the random assignment of infants to groups resulted in groups that were comparable in terms of scores on both the infant and most family measures at the onset of the intervention process.

It should be noted that the pattern of differences is substantially the same for the reduced group of subjects as it was for the overall group. Thus, the demographic data and the pretest data combined indicate that the reduced group is representative of the overall group.

Effects of Early Intervention Versus Medical Follow-up Without Intervention on Measures of Child and Family Functioning

The effects of the early intervention program on child functioning were assessed using the Battelle Developmental Inventory. These data were analyzed using one-way analyses of covariance (ANCOVA). ANCOVA procedures were employed for two purposes: (a) to increase the statistical power of the analyses by reducing error variance; and (b) to statistically adjust for any pretreatment differences between the groups. For either purpose, the degree to which ANCOVA is useful depends on the correlation between the covariates selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. Thus, the 1st posttest data were analyzed in a three-stage procedure.

First, the pretest BDI, demographics, and parent measures were examined for potential differences which might affect the posttest scores and which could thus be used as covariates in the analyses of the posttest results. As reported above, there were no significant differences between the groups on the pretest measures.

The second stage of the analyses examined the relations between the posttest scores on the child and family measures and the pretest measures via multiple regression analyses, again looking for potential covariates. Pretest variables that were strongly associated with the posttest measures were used as covariates in the third stage of the analyses; one-way between-groups analyses of covariance (ANCOVAs). The pretest variables that were used as covariates in a particular analysis are indicated in the column labeled "Covariates" in Table 10.4, which represents the results of the analyses of the first posttest child and family measures.

Analysis of the BDI scores indicated that the intervention and non intervention groups did not differ significantly on any of the subscales or on the total BDI score. While none of the differences were statistically significant, all favored the early intervention group.

Analysis of the PSI indicated that the groups did not differ significantly on either the child related stress scale or the other related stress scale. The effect size for child related stress (.42) indicates a large difference between the groups. With a larger sample size, this difference might be statistically significant. This result would indicate that those parents who had received intervention reported less stress related to their child than those who had not. On the other hand, the effect size for other related stress is comparable (-.38) and suggests that the parents who received the intervention services tended to report more stress related to factors other than their child.

The results of the analysis of the FACES III again indicated no statistically significant between groups differences. Again, however, examination of the effect sizes indicates a substantial effect size (.36) on the cohesion subscale, indicating that those parents who received early intervention services tended to report a more

Table 10.4

Posttest Measures of Child Functioning for Alternative Intervention Groups for LSU-IVH Treatment - No Treatment Comparison

		No Intervention				Early Intervention						
Variables	Covariates♣	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES˜
● Age in months at posttest	---	17.2	(2.5)	--	6	15.5	(.9)	--	12	4.46	.05	-.68
● Battelle Developmental* Inventory (BDI)												
DQs for:▲												
Personal/Social	1	83.3	(41.2)	70.1	6	83.0	(26.9)	82.9	12	1.33	.27	.31
Adaptive Behavior	2	75.0	(50.8)	78.8	6	89.8	(29.3)	86.4	12	.42	.53	.15
Motor	3	72.2	(27.0)	73.2	6	82.2	(30.3)	77.7	12	.14	.72	.17
Communication	4	72.5	(39.7)	68.5	6	80.3	(26.7)	82.1	12	1.86	.19	.34
Cognitive	5	51.1	(36.9)	69.2	6	89.4	(28.7)	88.7	12	1.73	.21	.53
TOTAL	6	83.3	(41.2)	72.2	6	88.8	(28.4)	88.7	12	3.52	.08	.40
● Parenting Stress Index• (PSI)												
Child Related	7,8	127.0	(21.0)	127.0	7	117.0	(14.0)	118.0	13	1.96	.18	.42
Other Related	7,8	126.0	(13.0)	129.0	7	131.0	(25.0)	129.0	13	.00	.99	.00
TOTAL	7,8	254.0	(36.0)	256.0	7	248.0	(36.0)	246.0	13	.49	.50	.28
● Family Adaptation and♦ Cohesion Evaluation Scales (FACES)												
Adaptation		5.2	(3.9)		7	5.5	(2.8)		13	.02	.90	-.08
Cohesion	1	7.0	(4.1)	6.8	7	5.1	(4.5)	5.3	13	.61	.45	.36
Discrepancy	--	2.3	(19.0)	3.0	7	11.4	(14.7)	10.6	13	1.20	.29	-.40
TOTAL	7	8.5	(4.1)	8.8	7	8.5	(2.7)	8.1	13	.25	.62	.17
● Family Resource Scale (FRS)		103.0	(24.0)		7	106.0	(20.0)		13	.08	.79	.12
● Family Support Scale (FSS)		34.0	(13.0)		7	27.0	(14.0)		13	1.19	.29	-.54
● Family Index of Life Events (FILE)		7.4	(7.2)		7	13.0	(11.0)		13	1.17	.29	-.77

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

• Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

♦ Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated by the family as being available. Higher scores are considered better.

˜ Effect Size (ES) is defined here as the difference between the groups (early minus Delayed) means, divided by the unadjusted standard deviation of the Delayed Intervention Group (see Glass, 1976; Tallmadge, 1977; Cohen, 1977 for a general discussion of the concept of Effect Size).

♣ Covariates: 1 = Battelle Adaptive Pretest; 2 = Battelle Personal-Social Pretest; 3 = Battelle Motor Pretest; 4 = Battelle Communication Pretest; 5 = Battelle Cognitive Pretest; 6 = Battelle Total Pretest; 7 = PSI Total Pretest; 8 = PSI Child Pretest

▲ DQ scores have been adjusted at tail ends by making 0 - 10 = 10 and > 115 put equal to 115.

cohesive family pattern. The effects size for the discrepancy subscale (-.40) suggests that those parents who received the early intervention reported a greater discrepancy between their perceived and ideal families.

Analyses of the FRS, FSS, and FILE indicated that the groups did not differ significantly on the number of resources, amount of support, or number of stressful

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life events that they reported. The large negative effect sizes for the FSS and FILE, however, indicates that the intervention group reported fewer social supports and more stressful life events during the previous twelve months, a difference which might be significant given a larger sample size.

Conclusions

This project provided limited data on the efficacy of an intensive intervention program for prevention or amelioration of developmental delays in infants at risk because of a history of complications of preterm birth. Analyses of the demographic data and the pretest data indicated that the random assignment procedure was successful in assuring the initial balance of the groups. There were no differences between the groups on the demographic measures, child measures, and most of the family measures at pretest.

While the results of the parametric analyses indicate that there were no statistically significant differences between groups on the child or family outcome measures, the large effect sizes on some of the measures indicate differences which might have been significant given a large sample size. Examination of the pattern of effect sizes reveals some interesting results. Of 16 analyses, 13 showed effect sizes greater than .25. Especially interesting, is the fact that 8 of the 13 effect sizes greater than .25 indicated differences in favor of the early intervention group.

Closer examination of the effect sizes indicates a consistent pattern for the BDI results. All of the effect sizes on the BDI results favored the intervention group. The posttest effect size differences may be attributed to a drop in BDI scores on the part of the non-intervention group. This result is consistent with other reports of declining test scores in similar low-SES populations. This result suggests that a similar decline may be reduced by the support provided by the early intervention program.

The effect sizes for the PSI indicate a similar result. The child related stress scale of the PSI showed an effect size of .42 favoring the early intervention group. The pretest effect size indicated that the groups did not differ on this scale. In fact, at pretest, the early intervention group reported a higher level of other related stress, a difference which was found at the posttest, however, the size of the difference was reduced. Comparison of the group means for child related stress indicates that the average stress level reported by the early intervention group remained the same between pre- and posttest, while that reported by the nonintervention group increased by 9 points. The increase in the stress level of the nonintervention group could be the result of having to care for the needs of a medically fragile infant without the support of an intervention staff.

The results of the analyses of the FACES III scales also are consistent with positive effects of the early intervention program. The cohesion scale, which showed an effect in favor of the nonintervention group at pretest (ES = -.46) showed an effect in favor of the intervention group at posttest (ES = .36). Examination of the group means again indicates that the change in effect sizes is attributable to the change in the score of the nonintervention group. While the level of family cohesion reported by the intervention group remained about the same between pre- and posttest, the nonintervention group reported less cohesion at posttest. This effect might also be attributable to the support provided by the early intervention program.

The effect size results for the discrepancy scale of the FACES III indicate that the early intervention group rates their ideal family pattern more different from the actual pattern than does the nonintervention group. The pretest effect size indicated that the groups did not differ on their perceptions of this discrepancy. As was the case with BDI and PSI scores, the change in the effect size is attributable to a decrease in the discrepancy reported by the nonintervention group and not to an increase in the discrepancy reported by the intervention group. This result is consistent with results reported by other intervention programs for medically fragile infants. For example, Zeskind and Iacino (1984) reported that mothers who received an intervention designed to support visitation of their infants in the nursery perceived their infants as less healthy, and had lower expectations for them than did mothers who spent less time with their infants. Thus, it is possible that the effect seen in the current study indicates that the parents who work more with their children see more closely the problems that their children have, and thus report more discrepancy between the ideal and actual family pattern.

Unfortunately, the results of this study must be considered equivocal and tentative because of the rate of attrition in this study and the small sample size.

COLUMBUS MEDICALLY FRAGILE PROJECT

Project #11

COMPARISON: Infants with Bronchopulmonary Dysplasia (BPD) or neurologic damage --Coordinated comprehensive services beginning one month prior to hospital discharge vs. services begun at 3 years of age.

LOCAL CONTACT PERSONS: Yvonne Gillette and Nancy Hansen, Columbus Children's Hospital

EIRI COORDINATOR: Nancy Immel

LOCATION: Columbus, Ohio

DATE OF REPORT: 4-9-1991

Rationale for the Study

Although significant advances in perinatal and neonatal care over the last decade have improved the outlook for the extremely premature infant, this group of infants still accounts for 50% of the neonatal mortality rate, and the surviving very low birthweight infants contribute significantly to the population of children with multiple disabilities (McCormick, 1985; Raju, 1986). Conditions frequently associated with survivors of premature birth include Bronchopulmonary Dysplasia (BPD) and abnormal neurologic findings.

The presence of chronic pulmonary disease (bronchopulmonary dysplasia--BPD) at the time of discharge from the nursery is one of the strongest predictors for multiple disabilities (Escobedo & Gonzales, 1986; Koops, Abman, & Accurso, 1984; O'Brodovich & Mellins, 1985). BPD is a unique disorder of the newborn infant who requires mechanical ventilation and oxygen therapy at birth (O'Brodovich & Mellins, 1985). BPD has become increasingly frequent as smaller and smaller infants survive, and affects up to 40% of surviving infants weighing less than 1500 g at birth (Escobedo & Gonzalez, 1986). Although BPD is a severe disabling disorder, it differs from other forms of chronic lung disease in that many affected infants demonstrate substantial improvement and recovery of lung function over the first few years of life. However, despite the encouraging improvement in pulmonary status, up to 40% of these infants have other major disabilities (Koops et al., 1984). The most frequent disabilities include growth failure, developmental delays, neurologic insults, visual problems, and deafness (Koops et al., 1984).

The etiology of the developmental delays observed in these infants is usually multifactorial and may be related to inadequate nutrition during a critical period of brain growth and differentiation. In addition to demonstrating developmental delays, these infants have substantial health problems beyond the neonatal period, and up to 30% are re-hospitalized during infancy (Hack, Caron, Rivers, & Fanaroff, 1983; McCormick, Shapiro, & Starfield, 1980).

A second predictor for neurodevelopmental delay in premature low birthweight children is the presence of abnormal neurological findings, including intraventricular hemorrhage (IVH), perinatal asphyxia, and congenital neurologic anomalies. Recent advances have been made in the early identification of brain insults which predict later neurologic impairment in this group of infants. It is now routine to monitor preterm infants for intracranial bleeding with the non-invasive cranial ultrasound. It is possible to identify infants in the first few months of life who are at extremely high risk for later neurodevelopmental delays on the basis of structural brain damage.

Perinatal care and medical advances have dramatically improved the short-term outlook for infants with BPD and neurological damage. However, most of the gain in expertise and knowledge is based in the tertiary care hospital and is not available to the infant, family, or local health, social service, and early intervention personnel following hospital discharge. Consequently, many local primary care physicians and public health nurses are uncomfortable supervising and directing the care of these complex children, and those families that live two to three hours from the tertiary care hospital have difficulty accessing adequate local medical care.

The resulting fragmentation of health care with multiple visits to multiple specialists at often geographically distant tertiary care centers is cited by parents as a major problem in caring for their chronically ill children. Added to the problem of inadequate local health care resources, families may find that local early intervention personnel are not trained in the specialized medical, educational, and social needs of medically fragile infants and their families, and that home-based intervention delivery may not be available as a service option. In sum, a critical need exists to assess the efficacy of projects which begin intervention in the NICU and provide transitions to community-based intervention programs.

Some evidence suggests that regionalization of care to the home and community can be an effective means of improving the functional status of the medically fragile infant. Several studies have successfully used home-based intervention programs to facilitate developmental progress in low birthweight infants (Infant Health and Development Program, 1990; Ramey & Campbell, 1987; Resnick et al., 1987). This project is unique in that all the infants being intervened with have serious medical considerations.

Philosophical and Theoretical Rationale for the Services

The practices of the Columbus Medically Fragile Project (Columbus/MF) flow from the theoretical position set forth by Urie Bronfennbrenner (1979) in The Ecology of Human Development. Bronfennbrenner views the environment as a set of nested structures, each inside the next. The basic unit is the setting, such as the family, which includes the developing person. The relationships between settings form the next level of influence upon development. Bronfennbrenner argues that the relationships between settings can play as decisive a role in development as the events within a given setting. Consequently, this project endeavors to facilitate the family's ability to meet the infant's needs and impact on the transition between the hospital and the community, since both can greatly influence the infant's development. Bronfennbrenner also contends that the practices of society at large can profoundly influence the developing person. The importance of this level of influence is exemplified by P.L. 99-457, the public law which encourages states to provide appropriate early intervention services to all handicapped infants and toddlers.

As the Bronfennbrenner model suggests, the families of medically fragile infants vary along several major dimensions: the functioning of the family, which includes and is affected by the status of the infant; the influence of the hospital; the effects of the practices of society at large; and the community resources available to the family. Following this model, the Columbus project attempted to enhance the family's functioning, the status of the infant, and the community's ability to meet the family's and infant's needs. The project also attempts to influence societal attitudes and practices as regards the care and development of the medically fragile infant and his/her family. Figure 11.1 illustrates the model used to design services for children and families participating in this project.

The Columbus/MF program serves as a model for specialized care and support to the home and community following hospital discharge of the infant, rather than basing this support in the tertiary care hospital. As previously indicated, the medically fragile infant is at established risk for developmental delays due to serious long-term medical and nutrition problems, lack of coordinated follow-up and intervention services in the local area, and lack of specialized training for local health, social

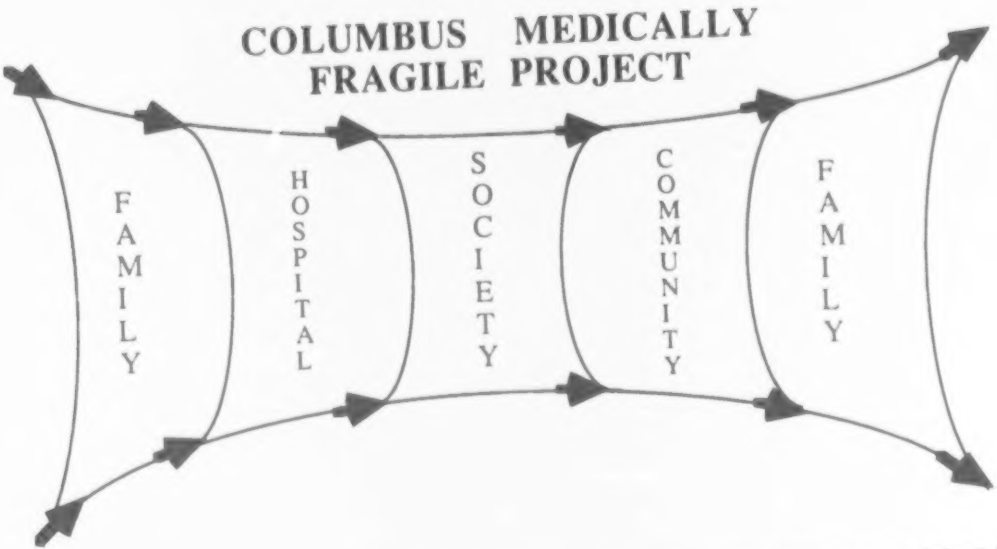

Figure 11.1: Path of the Columbus/MF Project Model facilitating optimal family and infant functioning from the hospital to the community and home.

service, and educational intervention personnel. There is a need to determine whether the developmental outcome of medically fragile infants and the functioning of their families can be improved through coordinated and comprehensive services to ease their transition from the hospital to their local community.

Overview of Study

This study compared the effects of a coordinated and comprehensive system of early intervention services initiated prior to discharge from the NICU with the effects of services obtained through hospital referrals following discharge. One group of infants, the early intervention group, received comprehensive coordinated services to facilitate their transition from a centralized source (the Columbus Children's Hospital), to regionalized sources (agencies within local communities). The randomly assigned comparison group of children received only the limited services available to CCH NICU graduates. The current level of services for children in this group have been described by Koops et al. (1984). These services include limited medical follow-up and management, developmental evaluation, and referral through the hospital follow-up clinic. Little attention was paid to the child's developmental progress in this group, as will be noted later.

Methods

The Columbus/MF Project was a cooperative research effort with "A Collaborative Approach to the Transition from the Hospital to the Community and Home Project," an HCEEP Demonstration Project of the Columbus Children's Hospital (CCH) in Columbus, Ohio. The project served graduates of CCH's newborn intensive care unit (NICU) and their families who lived in Ohio's Perinatal Region IV. This region encompassed 33 counties in the mid- and southeastern sections of the state. The area was primarily rural, although it included the urban center of Columbus.

The Columbus/MF HCEEP demonstration project was funded by the U.S. Department of Education from 1987-90. Year 1 was devoted to model development and focused on three objectives. The first objective was to establish collaborative intervention teams to service medically fragile infants and their families in the catchment area. To meet this objective, local administrators of health, social service, and education/early intervention agencies entered into collaborative agreements with the HCEEP project, and local intervention personnel were identified to provide services.

The second objective was to construct an intervention and service delivery model utilizing the following multiple assessment factors: current status of infants and their caregivers, stresses on the family and extra-familial systems, and the availability and use of family and extra-familial supports. Assessment and intervention protocols were developed and compiled to assess health and nutritional status, developmental status, parent-child interaction, home environmental factors, family stresses, and needed supports. The measures assessing infant and family characteristics are described in further detail in the data collection section of this paper.

The final objective, which was met during the project's first year, was the training of local collaborative intervention teams in the family-focused, home-based intervention model. In addition to orienting the collaborative intervention teams to the model, a series of multidisciplinary workshops, focusing on the medical, educational, and psychosocial needs of these infants and their families was held for all team members to promote collaborative case management, continuity, and transition of services.

During the project's second and third funding years, the efforts concentrated on subject enrollment, coordination of services and service provision, and data collection.

Subjects

The Columbus project enrolled 52 subjects between October 1, 1988, and March 12, 1990. A description of the recruitment and assignment procedures and the characteristics of study participants follows.

Recruitment. Medically fragile infants who were hospitalized in the Columbus Children's Hospital Intensive Care Unit were eligible to participate in the study if they were diagnosed with moderate to severe BPD and had a need for oxygen therapy and/or two or more pulmonary medications upon hospital discharge. Infants with neurologic conditions (severe [Grade IV] perinatal intraventricular hemorrhage, hydrocephalus, microcephaly) requiring specialized equipment (i.e., feeding pumps, suction, and/or aerosol equipment) were also eligible.

Eligible infants were identified for inclusion in the study when their weight reached 1500 g (approximately one month before discharge). At that time, the parents were contacted by the project's clinical nurse specialist. The nurse explained to the parents the nature of the study, requested their participation, and if parents were willing, obtained informed consent. If parents decided not to participate in the study, their infant received routine medical and developmental follow-up through the Neonatal Follow-up Clinic, and, if necessary, was referred to local agencies for limited health, occupational therapy, physical therapy, and early intervention services. Parents were informed of their child's group assignment after they completed the informed consent procedure.

Assignment to groups. Infants were enrolled in the study continuously between October 1, 1988, and March 12, 1990. Following enrollment, the infants were randomly assigned to either the high- or low-intensity groups after being stratified by their primary diagnosis of BPD or neurologic damage. The BPD and neurologic groups were each further stratified into groups of more or less severe illness based on the medical severity index developed by the hospital staff. The severity index allowed a physician to rate the infants on a scale of 0-5, with 5 being the most severe or abnormal rating on nine variables thought to be related to predicted medical outcome. The variables included the infant's degree of technology dependence, oxygen dependence, respiratory status, age at discharge, neurologic status, ultrasound/CT findings, head circumference, feeding status, and sensory impairment. A total severity score ranging from 3 to 45 points was obtained. Infants receiving a score of 18 and below were determined to be "low risk," and those receiving a score of 19 and above were considered "high risk." Following both stratification processes, group assignments were randomly made by the EIRI site coordinator, who was unknown to the infants and their families.

Subject Attrition. There were 52 subjects initially enrolled in the study. Four subjects (8%) died following pretesting. Of those subjects, three were assigned to the high-intensity group and one was assigned to the low-intensity group. Attrition accounted for three subjects (5%) from the high-intensity group who were dropped from the study at parent request.

An analysis of pretest demographic data measures of child and family functioning indicated no statistically significant differences between the subjects who remained in the study and those lost to attrition on any of the measures. Families of subjects lost to attrition had lower total household income, however, this difference was not statistically significant.

To minimize attrition, both the onsite coordinator and the EIRI coordinator maintained updated telephone numbers and addresses of the participants. Data were collected in person every six months until the infant reached 24 months age corrected for prematurity[1]. Infants and families in the high-intensity group were in frequent personal and telephone contact with study personnel as intervention services were delivered. By definition, infants in the low-intensity group did not meet with study personnel between assessments; however, the study was successful in assessing infants in both groups on time. If needed, study personnel arranged for transportation services to assist families in meeting scheduled assessment appointments.

Demographic characteristics. Information was gathered by questionnaires regarding family income, ethnic background, parent occupation, number of siblings, and primary caretaking responsibilities of the participating families. Results of the parent surveys indicated that 35% of the infants were from families living in Columbus, Ohio, and its immediately surrounding area. The remaining 63% resided in towns and rural areas of central and southeastern Ohio. One family moved from Ohio to the state of Indiana. The total sample was composed of 82% Caucasian infants and 18% non-Caucasian infants. Seventy-seven percent of the infants were from two-parent families, and 98.9% were from homes where English was the primary language spoken. Further information about the demographic characteristics of the infants and families in each group will be presented in the Results and Discussion section.

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[1] *In other words, a child who is born 4 weeks prematurely would not reach a corrected age of 12 weeks until 16 weeks after birth.*

Intervention Programs

The Columbus/MF Project compared a high-intensity intervention program to a low-intensity intervention program. Children in both groups received medical follow-up after their initial discharge from the NICU. The high-intensity intervention group also received coordinated and comprehensive services designed to improve their health and developmental outcome, and to facilitate their transition from the tertiary hospital to the local community. The low-intensity intervention group was referred to services identified at follow-up clinic visits.

High-intensity intervention program. Intervention services provided to the high-intensity intervention group consisted of pre-discharge hospital visits, medical follow-up clinic services, and coordinated multidisciplinary home-based early intervention services. The intervention began with two to three weekly hospital-based visits with families approximately one month prior to the infant's discharge from the NICU. The hospital-based visits, which were initiated by the project's clinical nurse specialist and/or social worker, provided an opportunity for families to begin to establish a support system with ties to both the hospital and their home communities, and to allow the project to assist families in planning for their infant's home care needs prior to discharge. These services were designed to help families begin to identify and initiate contacts with service providers in their local areas.

Because medical concerns took a primary role in the first weeks after discharge, local services often initially included 24-hour home nursing care, rental or purchase of durable medical equipment such as supplemental oxygen, ventilators, or positioning and feeding equipment. As the infants medical conditions stabilized in the home settings, additional services included public health, social service, mental health, education, or occupational, physical, and speech therapy.

After hospital discharge, infants received regular medical supervision and developmental evaluation through Columbus Children's Hospital High-Risk Neonatal Follow-up Clinic. The first medical follow-up visit occurred two weeks post-discharge. Additional visits were scheduled for 6, 12, 18, and 24 months of age (age corrected for prematurity), and yearly thereafter. The clinic was staffed by a neonatologist, a social worker, a nurse coordinator, and an occupational therapist who provided health monitoring and developmental evaluation. Full ancillary services (radiology, drug level monitoring, pharmacy, respiratory therapy, ophthalmology, and audiology) were available in the hospital complex.

Regular home visits were initiated following hospital discharge and continued until the child reached 24 months (age corrected for prematurity). The Columbus/MF project's clinical nurse specialist and developmental consultant attended the home visits with local service providers on at least a monthly basis. Whether or not these collaborative home visits were interdisciplinary depended on the concerns surrounding the infant and the family needs. Participants in these collaborative home visits included at least one member of the Columbus/MF project staff, one local service provider, the family (or at least the primary caregiver), and the infant. When conducting a collaborative home visit, the resource team members followed a four-step approach: (1) update, (2) plan, (3) practice, and (4) integrate into the family routine.

Update referred to the process during which the intervention group (resource team member, local service provider, and the family) reviewed any recent developmental assessments and previous plans. From the information shared in the update discussion, the intervention group planned for subsequent parent education and specific intervention for the infant and family related to developmental, health, and nutrition issues. Members of the team practiced specific intervention activities which were then integrated into family routines. Plans were put in writing and a method for monitoring the program was selected.

Local service providers were also encouraged to assist families in locating and utilizing additional community services such as respite care. The project gradually shifted responsibility from the resource team to the communities. The timing of this shift was individualized to meet the family's needs and the ability of the local service providers to take a more direct and independent role in working with this special population. The ultimate goal of the project was to transfer full responsibility for the care of the medically fragile infant to local service providers (physicians, public health nurses, early educators, etc.). It was anticipated that these agencies would continue to provide necessary services after the children reach 24 months of age and were no longer involved in this project.

Low-intensity intervention program. Infants in the low-intensity intervention group received the services that were available to all graduates of the NICU. These services included the same medical and developmental follow-up services of the High-Risk Neonatal Follow-up Clinic that infants in the high-intensity intervention group received. However, subjects in the low-intensity intervention group did not receive the coordinated transition services or the home-based early intervention services available to the high-intensity intervention group. Infants in the low-intensity intervention group who were found to be delayed, at-risk for delay, or in need of community services by the follow-up clinic, were referred to community agencies by the hospital follow-up clinic. These agencies were notified of the referral. These referral agencies were utilized inconsistently at best. Records documenting how often infants in the delayed group accessed referral services were kept and used in the data analysis.

Treatment verification. Treatment verification procedures were carried out to ensure that treatment occurred in accordance with the proposed intervention program plan. It consisted of data collected on the child, family, and intervention program. Treatment verification data on children in the high-intensity intervention group included the Individualized Family Service Plan (IFSP), a log of individual services provided, and attendance records. These data were collected and recorded by the local service provider and transition support staff.

Table 11.1 demonstrates that the high-intensity group received intensive services from the hospital transition team and local intervenor, while the low-intensity group did not receive those services. Information about additional services received by the child was collected from parents of children in both groups at pretest and at all interim and posttests.

Data on the family included an estimate of the quality of parent involvement by CCH project staff, a parent satisfaction questionnaire completed by parents at posttest, and an estimate of how well the parents felt they were able to integrate the infant's programs into their daily routine were also collected at posttest. The quality of parent involvement was evaluated on a scale of 1 - 3 on three qualities: attendance, parent knowledge of child's condition, and parent support of intervention program. Mean scores ranged from 2.3 - 3.0 in demonstrating parent involvement. There were no differences between groups in terms of parent involvement. The parents perception of how well they were able to integrate the program activities into their family routines was measured on a scale of 1-3, with 3 being the most able. There was no significant difference between the groups on the integration variable at posttest. Treatment verification information was also gathered on the intervention program itself. EIRI staff also maintained weekly telephone contact with the project staff, conducted three yearly site visits, and conducted an annual onsite review of the project.

A site review of the Columbus project was conducted August 23-24, 1990. The purpose of this review was to collect information about the nature and quality of intervention services provided to the high- and low-intensity intervention groups,

Table 11.1

Treatment Verification for the Columbus/MF Study

	Pretest 2 Weeks Post Discharge								Posttest I - 6 Months CCA								Posttest II - 12 Months CCA							
	Low Intensity			High Intensity					Low Intensity			High Intensity					Low Intensity			High Intensity				
Variable	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	T Value	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	T Value	P Value	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	T Value	P Value
Transition Team Visits																								
Nurse Office									0	------	--	.4	(.9)	26			0		0	.3	(.9)	6		
Nurse Home									0	------	--	6.9	(2.5)	21			0		0	3.7	(2.6)	6		
Pie Office									0	------	--	.3	(.7)	21			0		0	1.8	(3.1)	6		
Pie Home									0	------	--	4.7	(3.7)	21			0		0	13.3	(18.1)	6		
Local Intervenor Visits																								
Nurse Office									0	------	--	5.0	(19.5)	21			0		0	1.2	(2.0)	6		
Nurse Home									0	------	--	13.4	(20.6)	21			0		0	5.7	(6.4)	6		
Pie Office									0	------	--	4.3	(14.1)	21			0		0	7.7	(17.4)	6		
Pie Home									0	------	--	5.1	(5.5)	21			0		0	7.5	(8.7)	6		
OT/PT Office									0	------	--	.8	(2.7)	20			0		0	0		6		
OT/PT Home									0	------	--	1.2	(2.7)	20			0		0	2.3	(5.7)	6		
Other Office									0	------	--	.6	(2.0)	20			0		0	.2	(.4)	6		
Other Home									0	------	--	1.9	(6.7)	20			0		0	2.3	(5.7)	6		
Additional Services Received																								
PT/OT	.1	(.4)	26	.2	(.5)	25	-1.0	.33	4.3	(8.8)	20	4.6	(8.7)	19	-.12	.91								
Social Work Services	.1	(.3)	26	4.0	(17.9)	25	-1.1	.29	2.0	(8.0)	20	.6	(1.5)	19	.78	45								
Home Nursing	40.0	(106.4)	26	20.7	(52.1)	25	.8	.42	336.7	(938.3)	20	397.4	(1187.8)	19	-.18	.86	564.3	(1168 9)	18	557.5	(2209.7)	12	.02	.99
Nutritional Services	.3	(1.0)	26	.1	(.3)	25	1.1	29	.9	(1.1)	20	.7	(.9)	19	.68	.50	1.2	(2.3)	18	3.6	(11.5)	12	-.85	.40
Public Health																	4.7	(12.0)	18	1.3	(2.9)	12	.97	.34
Lessons	0.0		26	.2	(.8)	25	-	+									0	(0)	18	1.0	(3.5)	12	+	+
Other Services	2.5	(5.0)	26	1.3	(2.7)	25	1.1	.28	9.7	(37.3)	20	5.2	(7.3)	19	.53	.60	6.4	(13.3)	18	3.8	(5.4)	12	.75	.46
Parent Training	1.8	(5.0)	26	2.2	(4.7)	25	-.3	.75	3.1	(12.5)	20	1.5	(4.6)	19	.53	.60	1.4	(4.7)	18	0	(0)	12	+	+
Total Hours	43.7	(111.1)	26	28.0	(54.6)	25	.6	.52	387.8	(938.4)	20	465.8	(1181.8)	19	-.23	.82								
Integration of Services									1.3	(.5)	17	1.2	(.4)	18	.47	.64	1.2	(.5)	18	1.1	(.5)			
Social Worker Ratings of Parent																								
Parent Attendance																	2.8	(.6)	13	3.0	(.0)	5		
Parent Knowledge																	2.5	(.5)	13	2.8	(.4)	5	-.99	.34
Parent Support																	2.7	(.5)	13	2.6	(.9)	5	.29	.89
Nurse Ratings of Parent																								
Parent Attendance																	2.4	(1.0)	16	2.6	(.7)	11	-.78	.44
Parent Knowledge																	2.3	(.9)	16	2.4	(.7)	11	-.35	.73
Parent Support																	2.3	(1.0)	16	2.3	(.8)	11	-.06	.95

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and to verify that the research conducted by EIRI was being implemented as intended. The Guide for Site Reviews of EIRI Research Sites was used to evaluate program components of the project, and included a general review of program philosophy, subject records and assessment procedures, observations of staff-child and staff-parent interactions, and a review of administration and management procedures.

The overall results of the Site Review were very positive. Comprehensive and coordinated services were provided to the early intervention group, and data were managed in an exemplary manner. Furthermore, a review of 12-month interim data by the site review team indicated that there were substantial differences in the number and intensity of interventions received by each group. A full report of the site review is available from the site coordinator.

Cost of Alternative Interventions

The cost of early versus later intervention was determined by analyzing costs for both program alternatives on two levels. The first level consisted of the hospital-based CATCH team which coordinated services for the child on the local level following release from the hospital. The second consisted of the costs associated with the local agencies providing direct services to the children and families in the research study.

CATCH team resources for children in both groups (see Table 11.2) included direct service and administrative personnel, occupancy, equipment, materials and supplies, travel, and miscellaneous expenses. Personnel resources allocated to children in the two groups differed according to the actual amount of time spent. the allocation of resources to the control group is explained in more detail below. Direct service personnel costs include salaries and benefits for the pediatrician, nurse, social worker, parent-infant educator, and an occupational therapist. Salary and benefits were also calculated according to the percentage of FTE worked on the project for program administrative personnel: project director, secretarial and

Table 11.2

Columbus Medically fragile Project Costs (1990 Dollars)

	Experimental	Control
1. **UNDISCOUNTED COSTS**		
Agency Resources		
Direct Services	$ 2,900	$ 265
Administration	2,231	203
Occupancy	562	51
Equipment	133	12
Transportation	338	31
Materials/Supplies	181	16
Miscellaneous	91	8
SUBTOTAL	$ 6,436	$ 586
Additional Services		
Public Health Nurse	$ 1,121	$ 861
Early Intervention Program	2,133	389
Physical/Occupational Therapy	1,102	1,148
SUBTOTAL	$10,792	$2,398
GRANT TOTAL	***$10,792***	***$2,984***
2. **DISCOUNTED COSTS (3%)**		
Total Agency Resources	$ 6,828	$ 622
Total Resources	11,184	3,020
3. **DISCOUNTED COSTS (5%)**		
Total Agency Resources	$ 7,096	$ 646
Total Resources	11,452	3,044

support staff, and general hospital administration. The percentage of time devoted by the staff to the demands of the research were, of course, excluded from the costs of the service project. Hospital administrative costs were based on the hospital's indirect rate for administration (.22 of direct expenses). Occupancy charges are based on the 1989 rate per square foot for space used by the program, including plant operation, housekeeping, maintenance, repairs, and insurance. The project used 328 square feet at $12.86 per square foot for space, $2.43 per square foot for plant operation, $7.21 per square foot for housekeeping, $14.73 per square foot for maintenance repairs and insurance, for a total of $37.23 per square foot. Equipment included office equipment and furniture used for 3.0 FTEs. Market replacement values were ascertained for each item and an annualization factor was applied to arrive at an annual cost accounting for interest and depreciation. Travel expenditures were based on actual mileage. The cost of materials and supplies and miscellaneous expenses were based on the project's annual expenditure on these items.

CATCH team personnel costs for children in the control group were minimal; the nurse spent time recruiting, testing, and collecting child and family medical data, chart keeping, etc.; the social worker set up appointments and coordinated the OT clinic; the occupational therapist tested the children; and the pediatrician received visits from each child. These are all costs associated with the direct services provided by the project. For each of these activities, the actual amount of time spent and the associated cost of the time was determined. This time cost is the direct service cost for the control group. The direct service costs for the control group equaled 9.4% of total direct costs. Thus, this proportion was used as the best estimate of the proportion of indirect service resources used by the control group.

As previously mentioned, cost analyses were also conducted to determine the cost per child in both groups for services received in the community. Here, the emphasis was on services which the child or family received as a direct result of the CATCH team intervention and were services related to the child's condition or disability. Thus, social services such as WIC or subsidized housing, or social worker services were excluded because these were not related to the child's disability. Also excluded were individual physician fees, private home nursing care and equipment costs, and the cost of the NICU and readmissions to the hospital. These costs were a function of the severity of the child's condition and were services the child/ family would have received regardless of the efforts of the CATCH team.

From the additional services form, it was obvious that the CATCH team referred children and families to three main services: public health nursing (PHN), early intervention programs (EI), and physical and occupational therapists (PT/OT). A few children were referred to speech therapy services; however, there were so few instances that they were not included in the cost analysis. The costs for PHN, EI, and PT/OT were determined by contacting representative agencies providing these services to young children throughout Ohio, Indiana, and Pennsylvania to determine an average cost. In the case of the public health nursing, cost information was generally available in cost per visit; thus, this is the unit used for PHN in the analysis. PHN cost per visits did not significantly differ between urban and rural locations due to the higher cost of transportation in the rural setting which offset the potentially higher personnel costs in urban settings. For PT/OT and EI, cost figures were generally available in cost per hour and this is the unit used in the present analysis. Costs for PT/OT and EI did vary from urban to rural settings; the estimate used is an average of urban and rural figures obtained because children in the study were approximately balanced between urban and rural settings. Cost estimates used for the analysis were: (1) public health nurse at $72 per visit, (2) early intervention services at $37 per hour, and (3) PT/OT services at $75 per hour.

An estimate of the quantity of services received was obtained from the additional services forms filled out by the parents at the 2 week, 6 month, and 12 month assessments. Parents were asked to report, from a list of services, the number of sessions attended, hours per session, total hours of service received, and the agency providing the services. Each form was studied for inconsistencies or incompletions, and followed-up with the CATCH team personnel and parents to obtain an accurate as possible estimate of the quantity of services received by each family in the study. Total hours for PHN, EI, and PT/OT were tallied and multiplied by their respective costs per hour to determine total cost of these services in each group. These were divided by the number of children in the group to arrive at average cost.

All figures on Table 11.2 are in constant 1990 dollars. For purposes of the calculation of CATCH team cost per child, there were 21 children in the experimental group and 24 in the control group--the actual number of children served through 12 months at the time of this analysis; for additional services cost estimation, data were available for 23 in the control group and 21 in the experimental group. At the bottom of Table 11.2, CATCH team costs have been discounted using discount rates of 3% and %5. Additional services costs are current and, therefore, at the time of this report, not yet subject to the effects of discounting.

As Table 11.2 indicates, the CATCH team had a significant impact on whether the families sought and obtained early intervention services for their children. Children in the experimental group received five times as many hours of early intervention services as children in the control group (1,210.5 hours versus 242 hours). The CATCH team had a lesser impact on the amount of public health nursing visits received--327 visits for the experimental group and 275 visits for the control group children. There is a small difference between hours of PT/OT received by children in each group which favors the control group. Total hours were 308.5 for experimental and 352 for control.

Overall, the CATCH team seems to have accomplished its goal of connecting children with early intervention services in their community. Thus, in addition to case management and referral, the CATCH team is providing an important child-find service. Due to random assignment, we can assume that there are at least as many children in the control group who are eligible for such services and are not receiving them. Since Ohio has decided to mandate services to infants and toddlers under Part H of P.L. 99-457, this is an especially interesting finding for the Department of Health who is the lead agency. In addition, the data suggest that public nurse home visits and whether or not the child receives PT/OT services are probably independent of the CATCH team. In other words, children in both groups are balanced with respect to physical disability and will receive those services if they need them regardless of the existence of a CATCH team.

Data Collection

Data collected at the Columbus project included the results of outcome measures used across all EIRI sites and measures specific to this study. Outcome measures included assessments of both child and family functioning. As indicated earlier, infants were enrolled in the study approximately one month prior to their discharge from the NICU, and they were pretested two weeks following discharge. Pretest data were collected on 52 infants. Outcome data were collected on subjects at 6 and 12 months corrected age. All EIRI assessments took place at CCH in conjunction with NICU follow-up clinic visits.

Recruitment, training, and monitoring of diagnosticians. In June 1988, diagnosticians were trained in Columbus by the EIRI Evaluation Specialist to administer the Battelle Developmental Inventory (BDI). Three diagnosticians were Registered Occupational Therapists employed in the Occupational Therapy Department of Columbus Children's Hospital. The fourth diagnostician was an Early Childhood Specialist employed in the Child Life Department of Columbus Children's Hospital. While their work assignments involved in-patient and out-patient care, none of the therapists was assigned to the NICU or the Neonatal Follow-up Clinic. They evaluated the subjects as a part of their regular employment and were uninformed as to the purpose of the study and the group assignment of the infants.

Prior to the formal BDI training, the diagnosticians were required to become familiar with the BDI through a review of the test manuals, practice in scoring, viewing of a videotape of test administration procedures, and completing a self-mastery test. The diagnosticians then completed three practice BDI administrations. The third practice session was videotaped and reviewed by the EIRI Evaluation Specialist who then certified the diagnostician. In each year following certification, 10% of each diagnostician's test administrations were shadow scored for reliability by the onsite assessment coordinator. The assessment coordinator was responsible for tracking and scheduling evaluations for each subject. A more in depth discussion of test administration procedures is available in the EIRI 1986-87 annual report.

Pretesting. Two weeks following discharge from the NICU, all infants in the study were scheduled for the first visit to the Neonatal Follow-up Clinic, where their health status, growth, pulmonary function, and rehospitalization record were evaluated. At that time, infant assessments also included the BDI and the Infant Neurological International Battery (the Infanib), a measure of neurologic integrity in the newborn and infant. The Parenting Stress Index (PSI), an assessment of the stress present in the parent-child system; the Family Adaptability and Cohesion Evaluation Scales (FACES III), an assessment of the separateness or connectedness and adaptability of the family members to the family; the Family Support Scale (FSS), a measure of different sources of support available to families with young children; the Family Resource Scale (FRS), a measure of the different kinds of resources available to the family; the Family Inventory of Life Events and Changes (FILE), which assesses the life events and changes experienced by the family during the previous 12 months; and the Parent Survey (demographic information) were completed by the parents. Parents were paid $20 for completing the pretest assessment battery.

Tests and questionnaires were returned to EIRI for scoring, data entry, and storage. Table 11.3 presents a schedule for the administration of assessment measures.

Table 11.3

Schedule of Assessment Measures--Columbus Age-At-Start

	Enrollment	Discharge	Pretest--2 wks Post Discharge	Outcome Tests at 6 mo CCA*	Outcome Tests at 12 mo CCA*	Outcome Tests at 18 mo CCA*	Outcome Tests at 24 mos CCA*
BDI			X		X		X
PSI			X		X		X
FACES III			X		X		X
FSS			X	X	X	X	X
FRS			X	X	X	X	X
FILE			X		X		X
Additional Services Survey			X	X	X	X	X
Medical Severity Index	X	X					
EIRI Parent Survey			X		X		X
Infanib			X	X	X		
Medical Visit Summary		X	X	X	X	X	X
Carey Infant				X			
Bayley				X		X	
Social Work Parent Survey				X			
Report of Child Health					X		X
Parent/Child Interaction Video					X		X

* Corrected Chronological Age (age corrected for prematurity)

Outcome tests. The first outcome tests were scheduled when the infant was 6 months old (age corrected for prematurity). At this time, the infant received a physical examination and was assessed using the Bayley Scales of Infant Development and the Infanib. At that same time, parents completed the Carey Infant Temperament Scale, the FSS, and the FRS. An additional services form reporting services that were used since pretest in conjunction with infant care and development, and a social work questionnaire developed by the CCH team social worker were completed in an interview with the social worker.

A second outcome testing session was scheduled when the infants were 12 months (ages corrected for prematurity). At the posttest sessions, infants and their parents again completed the pretest battery. In addition, parents complete the Parent Satisfaction Survey and the Report of Child Health. The additional services form was completed during an interview with the social worker. The outcome test at 18-months consisted of a physical examination, re-administration of the Bayley, the FSS, the FRS, and the additional services survey. At the 12 and 24 month posttests, parents and infants were videotaped during a scripted 16-minute period which included free play and structured activities. The videotapes are to be coded and scored as a measure of parent-child interaction. Parents were paid $20 for completing each outcome test battery. Table 11.4 presents a summary of the number of infants who have been tested to date.

Table 11.4

Summary of Subjects Assessed by July 1, 1990

Time of Assessment	Number Assessed to Date*
2 Weeks Post Discharge	14
6 Months (age corrected for prematurity)	40
12 Months (age corrected for prematurity)	20
18 Months (age corrected for prematurity)	11
24 months (age corrected for prematurity)	0

Results and Discussion

The purpose of the Columbus Medically Fragile study was to compare the effectiveness of comprehensive and coordinated early (high-intensity) intervention services begun prior to the infant's discharge from the NICU to a low intensity intervention consisting of medical follow-along and referral.

Comparability of Groups on Pretest Measures

A pretest comparison of family demographic characteristics of all active subjects enrolled in the study and of those subjects included in Posttest #1 indicated that the high-intensity and low-intensity intervention groups were similar in all characteristics (Table 11.5).

Table 11.5

Comparability of Groups on Demographic Characteristics for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES^
• Age of child in months as of 7/1/89	4.0	(4.9)	26	4.0	(5.2)	26	.96	.00
• Age of mother in years	25.6	(6.7)	26	27.3	(6.3)	26	.35	.25
• Age of father in years	29.6	(8.2)	25	30.4	(7.3)	24	.70	.10
• Percent male*	31	---	26	19	---	26	.35	
• Years of education for mother	12.5	(2.0)	26	12.6	(2.4)	26	.75	.05
• Years of education for father	12.2	(1.2)	26	13.1	(2.3)	26	.10	.75
• Percent with both parents living at home	76	---	25	77	---	26	.94	
• Percent of children who are* Caucasian	81	---	26	81	---	26	1.00	
• Hours per week mother employed▲	9.5	(15.4)	26	12.2	(17.1)	26	.55	.49
• Hours per week father employed▲	31.6	(18.8)	25	39.2	(16.6)	25	.14	.40
• Percent of mothers employed as* technical managerial or above	8	---	26	23	---	26	.13	
• Percent of fathers employed as* technical managerial or above	22	---	23	31	---	26	.49	
• Total household income♦	$25,540	($22,184)	25	$31,962	($27,495)	26	.36	.29
• Percent of children in daycare*▲ more than 5 hours per week	15	---	26	4	---	26	.17	
• Number of siblings▲	1.5	(1.8)	26	1.2	(1.3)	26	.48	-.17
• Percent with English as* primary language	96	---	26	100	---	26	+	

^ Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

* Statistical analyses for these variables were based on a t test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

♦ Income data were categorical and were converted by using the midpoint of each interval into continuous data.

▲ Some posttest information was used to arrive at these figures.

+ One of the groups has no variance.

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A comparison of the demographic characteristics of all infants enrolled in the high-intensity and low-intensity intervention groups at pretest indicated that the groups were similar in most medical characteristics. However, as can be seen in Table 11.6, infants in the low-intensity intervention group had significantly more feeding problems as measured by the Medical Severity Index administered at Pretest.

Table 11.6

Comparability of Groups on Medical Characteristics for Columbus medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES[^]
Gestational age (Weeks)	31.0	(4.7)	26	31.1	(4.5)	26	.95	.02
Birthweight (grams)	1744.2	(861.2)	26	1615.1	(883.6)	26	.60	-.15
Severity Index at Enrollment (Range: 3 to 45)	15.3	(4.1)	26	14.2	(6.2)	26	.50	-.27
Length of Hospitalization (Days)	102.4	(75.4)	26	118.6	(91.0)	26	.49	.21
Total Doses of Medication Daily (at Pretest)	7.1	(9.5)	26	5.4	(9.0)	26	.50	-.18
Technology Dependence (at Pretest)[*]	.7	(1.1)	26	1.2	(1.6)	26	.17	.50
Feeding Status (at Pretest)[*]	2.5	(1.4)	26	1.9	(1.3)	26	.16	-.43
Sensory Impairment (at Pretest)[*]	1.1	(.9)	26	1.1	(1.1)	26	.89	.00
Infant International Neurological[♦] Battery (INFANIB) (Range: 20 to 100)	59.9	(6.4)	25	58.0	(7.4)	26	.64	-.30

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[*] Technology dependence, feeding status, and sensory impairment at discharge were measured on a scale of 0-5 with low scores being more favorable.

[♦] Higher scores on the INFANIB indicates greater neurological maturity.

Table 11.7 shows infant pretest scores on the BDI and measures of family functioning. The groups were similar on all of the BDI domain and total scores. They were also similar on three measures of family functioning, including the FACES,

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Table 11.7

Comparability of Groups on Pretest Measures for Columbus Medically Fragile Study

	Active Subjects Enrolled in Study							
	Low Intensity			High Intensity				
	$\bar{X}$	(SD)	n	$\bar{X}$	(SD)	n	P Value	ES[~]
• Age in months at pretest	1.7	(2.1)	24	1.8	(2.8)	21	.90	.05
• Battelle Developmental['] Inventory (BDI) Raw Scores for:								
Personal/Social	5.9	(4.0)	24	7.6	(6.0)	21	.25	.43
Adaptive Behavior	3.8	(2.8)	24	4.7	(4.2)	21	.43	.32
Motor	5.1	(4.5)	24	4.8	(4.5)	21	.81	-.07
Communication	4.5	(2.0)	24	4.7	(2.6)	21	.86	.10
Cognitive	3.4	(3.1)	24	2.8	(3.3)	21	.55	-.19
TOTAL	22.7	(14.9)	24	24.7	(19.4)	21	.70	.13
• Parenting Stress Index (PSI)[#♦]								
Child Related (range 47 to 235)	110.8	(23.5)	23	111.7	(23.8)	21	.90	-.04
Other Related (range 54 to 270)	137.9	(52.8)	23	115.2	(27.4)	21	.08	.43
TOTAL (range 101 to 505)	222.4	(54.1)	23	226.9	(45.2)	21	.77	-.08
• Family Adaptation & Cohesion[#*] Evaluation Scales (FACES)								
Adaptation (range 0 to 26)	4.3	(3.6)	24	5.4	(5.4)	21	.41	-.31
Cohesion (range 0 to 30)	4.8	(4.4)	24	5.8	(5.0)	21	.46	-.23
TOTAL (range 0 to 40)	7.2	(4.5)	24	9.1	5.8	21	.23	-.42
• Family Resource Scale (FRS)[♣]	117.2	(18.5)	24	126.0	(17.8)	21	.11	.48
• Family Support Scale (FSS)[♣]	26.2	(9.6)	24	32.0	(9.4)	21	.05	.60
• Family Index of Life Events[▲#] and Changes (FILE)	11.6	(4.9)	24	12.1	(6.9)	21	.11	.10

[~] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

['] Statistical analyses for BDI Scores were conducted using computed scores for each of the scales. Development Quotient (DQ) was obtained by dividing the "Age Equivalent" (AE) score reported in the technical manu for each child's raw score by the child's chronological age at time of testing.

[#] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

[♣] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Positive ESs are considered better.

[▲] A low raw score indicates low stress level, and a positive effect size is more desirable.

[♦] A low raw score indicates lower stress level.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental groups scored closer to "ideal."

FRS, and FILE. The groups differed significantly, however, on the FSS where families in this high-intensity intervention group reported greater availability of support at the time of the pretest than did families in the low-intensity group. Families in the high-intensity group also reported less "other related" stress on the PSI than did families in the low-intensity group although this difference was not statistically significant.

Effects of High Intensity vs. Low Intensity Intervention on Measures of Child Functioning

Analysis of covariance procedures were used to measure differences between groups on measures of child and family functioning following early intervention services to one group of infants and delayed intervention to the other group. Analysis of covariance procedures were used for two reasons: (a) to increase the statistical power of the study by reducing error variance; and (b) to adjust for any pretreatment differences which were present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates (usually five or less) in any given analysis. All pretest and demographic variable were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. For example, child's age, level of severity at discharge, score on Infanib and mother's age were used as covariates for 12 month Battelle Personal Social raw scores. The combination of these variables reduced the amount of unexplained variance in the 12-month Battelle Personal Social raw scores better than other combinations of pretest and demographic variables. In each analysis, the specific covariates used are indicated in the table. ANCOVA results are shown in Table 11.8. The analysis of data collected at 12-months CCA indicated that infants in the high-intensity group performed better than infants in the low-intensity group on the Battelle Personal Social domains ($p < .10$).

Table 11.8

Summary of ANCOVAs on Measures of Child Functioning for Alternative Intervention Groups for Columbus Medically Fragile Study

		12-Month Analyses										
		Low Intensity Group				High Intensity Group						
	Covariate[♦]	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	$\bar{X}$	(SD)	Adj.$\bar{X}$	n	ANCOVA F	P Value	ES[`]
Battelle Developmental Inventory['] (BDI)												
Personal/Social	2,10,11	37.9	(17.2)	38.8	18	49.2	(16.4)	48.3	14	7.05	.01	.55
Adaptive Behavior	10,15	37.3	(24.9)	38.0	18	47.0	(34.3)	37.3	14	1.31	.26	-.03
Motor	2,15,16,18	34.5	(17.9)	35.8	17	37.6	(24.6)	36.4	12	.04	.85	.03
Communication	2,10,18	45.1	(29.7)	47.3	17	56.3	(33.0)	54.1	12	.74	.40	.17
Cognitive	10,14,15	46.7	(26.1)	45.5	18	46.0	(26.4)	47.2	14	.07	.79	.07
TOTAL	2,10,15,18	40.5	(22.4)	42.0	17	47.8	(28.3)	46.3	12	.75	.40	.19
Rating of Child's Health[♣]	7,14	1.8	(.7)	1.8	12	1.7	(.5)	1.7	15	.44	.51	-.14

['] BDI Statistical Analyses for BDI Scores were conducted using computed scores for each of the scales. Development quotient (DQ) was obtained by dividing the "Age Equivalent" (AE) score reported in the technical manual for each child's raw score by the child's raw score by the child's chronological age at time of testing.

[`] Effect Size (ES) is defined here as the difference between the groups (High Intensity vs. Low Intensity) on the X scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[•] Variables for which there are pretest differences.

[♦] Covariates: 1 = Adaptation--Faces; 2 = Child's age; 3 = Days on oxygen; 4 = Days on ventilator; 5 = Education, Father; 6 = Education, mother; 7 = Length of hospital stay; 8 = Hours worked per week, Father; 9 = Income; 10 = Scores on INFANIB; 11 = Mother's age; 12 = Neurological status at entrance; 13 = Oxygen dependence at enrollment; 14 = Risk category at enrollment; 15 = Level of severity at discharge; 16 = Level of severity at enrollment; 17 = Hours worked per week, mother; 18 = Father's age; 19 = Diagnosis category at enrollment; 20 = Daycare over 5 days per week.

[♣] Parents rated their child's health on a 3-point scale (1 = worse than peers, 2 = same as peers, 3 = better than peers).

Effects of Alternative Forms of Intervention on Measures of Family Functioning

Table 11.9 presents the results of the ANCOVA comparisons of posttest measures of family functioning. ANCOVA results indicated that groups were similar on most

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measures of family functioning at 12 months CCA. However, families in the high-intensity group indicated by scores on the FRS that they had access to more resources than did the families in the low-intensity group. The high-intensity group families also tended to report less Child Related Stress on the PSI, although, again, the difference were not statistically significant.

Table 11.9

Summary of ANCOVAs on Measures of Family Functioning for Alternative Intervention Groups for Columbus Medically Fragile Study

		12-Month Analyses										
		Low Intensity Group				High Intensity Group						
	Covariate[♦]	X̄	(SD)	Adj.X̄	n	X̄	(SD)	Adj.X̄	n	ANCOVA F	P Value	ES[^]
Parenting Stress Index (PSI)[δ♣]												
Child Related (range 47 to 235)	6,9,19	107.8	(19.5)	108.1	17	104.3	(18.3)	104.1	15	.59	.45	.21
Other Related (range 54 to 270)	6,11	127.0	(20.2)	126.5	18	124.8	(28.2)	125.3	15	.03	.88	-.04
TOTAL (range 101 to 505)	6,19	235.1	(34.7)	35.4	18	229.1	(41.9)	228.7	15	.45	.51	.19
Family Adaptation and Cohesion Evaluation Scales (FACES)[*δ]												
Adaptation (range 0 to 26)	9	6.2	(4.1)	6.2	17	5.0	(4.2)	5.1	15	.60	.44	.27
Cohesion (range 0 to 30)	10,6	5.1	(5.3)	5.3	18	7.4	(8.1)	7.1	14	.78	.39	-.34
TOTAL (range 0 to 40)	10,6	8.8	(5.5)	9.0	18	9.4	(8.6)	9.2	14	.00	.95	-.04
Family Resource Scale[♠] (FRS)	20,9	115.3	(17.2)	118.8	17	127.4	(16.9)	124.2	14	1.12	.30	.31
Family Support Scale[♠] (FSS)	8	25.7	(10.1)	25.8	18	27.0	(10.8)	26.9	14	.09	.77	.11
Family Index of Live["] Events (FILE)	8	8.0	(4.9)	8.0	18	9.5	(5.4)	9.6	15	.89	.35	.33

[^] Effect Size (ES) is defined here as the difference between the groups (High Intensity minus Low Intensity) on the X̄ scores, divided by the standard deviation of the Low Intensity Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[δ] Statistical analysis and Effect Size (ES) estimates for PSI, FILE, and FACES were based on raw scores where low raw scores and positive ES are most desireable.

[♣] A low raw score indicates lower stress level.

[♠] No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as part of the Longitudinal Studies (currently, 645 families with handicapped children).

["] A low raw score indicates lower stress level, and a positive effect size is more desireable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best and positive ESs indicate that the experimental group scored closer to "ideal."

[♦] Covariates: 1 = Adaptation--Faces; 2 = Child's age; 4 = Days on ventilator; 5 = Education, Father; 6 = Education, mother; 7 = Length of hospital stay; 8 = Hours worked per week, Father; 9 = Income; 10 = Scores on Infanib; 11 = Mothers age; 13 = Oxygen dependence at enrollment; 19 = Diagnosis category at enrollment; 20 = Daycare over 5 days per week.

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Conclusions

Overall, the pretest comparisons indicate that randomization procedures have resulted in well-matched groups as the intervention phase of this project began. Statistical differences between groups were found to exist in the degree to which infants experienced feeding problems when they were discharged from the NICU and in the number of supports available to the family as described by the infants' parents. The groups were found to be similar on all other infant and family demographic characteristics and on measures of infant and family functioning. In light of the many different variables on which groups were compared, it was not surprising to find several on which there were statistically significant differences between groups. When data were considered in total, it appears that groups were well matched and very comparable.

That the intervention was initiated as intended was evidenced by the fact that 96% of the infants in the early intervention group were referred to their county collaborative groups as they were discharged from the hospital, while only 4% of the infants in the delayed intervention group received such a referral. Posttest results revealed that families in the high-intensity intervention group report that they have significantly more resources available to them than families in the low-intensity group. Although this difference is a preliminary finding since not all of the posttest data has yet been gathered, it is encouraging in light of the goals of the intervention. It suggests that the hospital-based transition services may have assisted families in accessing appropriate community services. It is also possible that many of the effects of the transition services may not be apparent from standardized measures of child and family functioning, although the results at 12 months indicate differences favoring the high-intensity group on Personal/Social and Adaptive Behavior Domains.

A REVIEW OF RESEARCH ON PARENT INVOLVEMENT IN EARLY INTERVENTION

One of the most frequent claims of researchers, administrators, and practitioners involved in early intervention is that parent involvement leads to more effective intervention programs. The claim that parent involvement is essential to child development and educational success is not new. Frederick Frobel, one of the primary contributors to the establishment of American kindergarten programs, argued that,

> All are looking for reform in education....If building is to be solid, we must look to the foundations--the home. The home education of rich and poor alike must be supplemented....It therefore behooves the state to establish institutions for the education of children, of parents and of those who are to be parents. (Hauschmann, 1897, p. 183, as cited in Karnes & Lee, 1978, p. 13)

The emphasis on involving parents in the education of their children has continued unabated to the present time. In every decade since the turn of the century, there have been many who have advocated vigorously for the importance of involving parents in all educational efforts (see Florin & Dokecki, 1983, and Fein, 1980, for an excellent summary of the historical involvement of parents in educational programs).

With the federal funding of Head Start in 1965, and the Handicapped Children's Early Education Program (HCEEP) in 1968, early intervention became established as a full-fledged movement. Given the history of parent involvement programs in this country, it was no surprise that the importance of involving parents was emphasized as a key to the success of these programs. Since that time, the importance of involving parents in early intervention programs for children who are disadvantaged, disabled, and at-risk has gained momentum until it has now been established as being axiomatic that early intervention programs will be more successful if parents are involved.[1]

One of the latest demonstrations of support for the position that parent involvement is essential for successful early intervention programs was provided when Congress passed the 1986 Amendments to the Education of the Handicapped Act (Public Law 99-457), which established what amounts to mandated early intervention programs for all children with disabilities by the year 1991. The committee report, which describes Congress' rationale behind the legislation, states,

> The committee received overwhelming testimony affirming the family as the primary learning environment for children under six years of age and pointing out the critical need for parents and professionals to function in a collaborative manner. (From House Report #99-860 as cited in Gilkerson, Hilliard, Scharg, & Shonkoff, 1987, p. 20)

The breadth of support for the benefits of involving parents in early intervention efforts was noted by White et al. (1985-86) in their analysis of 52 previous reviews of the early intervention efficacy literature. White et al. (1985-86, p. 423) reported that the most frequently-drawn conclusion in previous reviews was that "parental involvement is associated with increased benefits of intervention."

In spite of the pervasiveness of support for the benefits of parent involvement, it is unclear whether the available research evidence is consistent with frequently made claims, or whether opinions concerning the value of involving parents in early intervention programs have taken on a "life of their own," and have grown in strength and breadth as a result of socio-political factors instead of from defensible, consistent, scientific evidence regarding the benefits of such involvement.

This section provides a detailed analysis of the evidence concerning the benefits of involving parents in early intervention programs. We begin by discussing the definitions of parent involvement (interestingly, such definition is absent in legislation such as P.L. 99-457, and is seldom present in the research literature used to support claims about the effectiveness of parent involvement). Next, a summary is given of the reasons most frequently offered as to why parental involvement is so important. Using the definitions of parent involvement, and the reasons offered for involving parents, we then examine the data concerning the benefits associated with parent involvement, and conclude with recommendations for future research and practice.

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[1] *Even though it will be discussed more specifically later in this section, it is important to point out here that the contention that early intervention programs will be more successful if parents are involved is very different from the contention that parents can be effective teachers of their own children. The question addressed by this report is limited to the frequently-stated position that the involvement of parents in existing early intervention programs* ***adds*** *some benefit to the program.*

Defining Parent Involvement in Early Intervention Programs

In spite of the pervasiveness of the position that parent involvement is the key to effective early intervention programs, very few previous authors have defined what they mean by parent involvement. Some indication of what is meant can be gleaned from the program descriptions in research studies which have included a parent involvement component; however, these definitions of intervention are often vague and were probably never intended to be comprehensive. Furthermore, the definition of parent involvement may well be different depending on whether we are talking about early intervention with children who are disadvantaged, disabled, or at-risk[2]. In an effort to define parent involvement, Peterson and Cooper (1989) provided a list of six different components that may be involved in parent involvement programs associated with early intervention for children with disabilities. Those components are defined by Peterson and Cooper according to the following needs that parents may experience:

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[2] *We make a distinction here between children who are disadvantaged (defined in terms of socioeconomic conditions) and at-risk (defined in terms of medical complications or predisposing factors such as low birthweight, trauma surrounding the birth process, or neonatal complications). Obviously, some children who meet our definition of at-risk are also disadvantaged, but not all children who are disadvantaged are also at-risk according to this definition. We believe it is important to distinguish between children who are disabled, disadvantaged, and at-risk, since the type of intervention programs, and consequently, the type of parent involvement, may be very different for children in each of these three groups. Of course, there is a great deal of overlap in how parent involvement is typically provided to children in each of these groups.*

- ***Information*** is needed by parents to better understand their child's disability, how it will effect development, what special needs it creates, and how this may alter their role and interaction with the child.

- ***Professional partnership*** is often needed by parents to function in the mutual problem-solving necessary for caring for, managing, teaching, and integrating the child into ongoing family life.

- ***A support network*** is needed to share feelings, discuss concerns, receive constructive and empathetic responses to questions and observations, and enjoy a sense of friendship and camaraderie.

- *Training* is needed to help parents care for, stimulate, and teach their child with a disability; including training in how to best manage the child and/or how to engage the child in activities that will promote optimal development and learning.

- ***Time off or respite care*** is needed on an intermittent basis to provide "personal relief" from the 24-hour demands for care and supervision often associated with having a handicapped child.

- ***Informal contact with staff*** is needed for parents to be a part of the therapeutic and educational programming for their handicapped child without feeling overwhelmed by demands being made of them as parents.

The six areas of need outlined by Peterson and Cooper (1989) describe the types of activities typically included to some degree in parent involvement programs, but they do not refer to the concept of "*empowerment*." In recent years, the term empowerment has been used frequently to describe the type of parental involvement that many people believe is most effective in early intervention programs (see Cochran, 1988; Dunst et al., 1988; and Rappaport, 1981). In reality, the notion of empowerment really focuses more on an attitude towards parents, and the "balance of power" between parents and professionals. In other words, parents could engage in any of the activities described by Petersen and Cooper (1989) in a situation where empowerment is nurtured or denied. This is clear when one considers the definitions given by leading proponents of empowerment.

> ***Empowerment***--an interactive process involving mutual respect and critical reflection, through which both people and controlling institutions are changed in ways that provide those people with greater influence over individuals and institutions that are in some way influencing their efforts to achieve equal status in society. (Cochran, 1988, p. 72)

> ***Empowerment*** implies that many competencies are already present or at least possible....Empowerment implies that what you see as poor functioning is a result of social structure and lack of resources which make it impossible

> for the existing competencies to operate. It implies that in those cases where new competencies need to be learned, they are best learned in a context of living life, rather than in artificial programs where everyone, including the person learning, knows that it is really the expert who is in charge. (Rappaport, 1981, p. 16)

As Cochran (1989) points out, empowerment represents an effort to shift the balance of power from being primarily in the hands of professionals to substantially in the hands of the parents. Although empowerment is often discussed as if it were a new approach to parent involvement in early intervention programs, Mindick (1988) points out that it is a concept which has been advocated by some for many, many years. Researchers in other fields, such as Rotter (1966) and Seligman (1975) have long emphasized the importance of people feeling like they are in control of the situation. In addition, from its inception in 1965, the Head Start program has emphasized the importance of parental control and participation in governance.

Thus, it seems that there are at least two important dimensions which should be considered in defining parent involvement in early intervention programs. The first is the type of activities in which parents are engaged or the types of resources and assistance which are offered to parents and families as a function of parent involvement. Peterson and Cooper's outline is one way of describing those activities. A second dimension is the attitude and context in which those activities are presented. The presence or absence of empowerment as described by Dunst and Trivette (1988) or Cochran (1988) is one way of describing this second important dimension. Since empowerment is defined largely in terms of the attitude with which professionals involve parents, it is extremely difficult to determine from program descriptions the degree to which empowerment is functioning. Not only are the descriptions of parent involvement usually quite brief, but one can say that parents are being empowered because it is the socially acceptable thing to be doing, when in reality it is the professionals who are retaining total control of the program. The difficulty in determining the degree to which empowerment functions does not in any way reduce its potential value, but it does make it difficult to determine the degree to which the concept has value.

Although conceptual definitions of parent involvement and discussion of the potential benefits of empowering parents are useful, they do little to describe how parent involvement programs are typically implemented. To do that, we analyzed the descriptions of early intervention programs used in 172 different intervention studies which were judged to have substantial parent involvement components as a part of a comprehensive review of the early intervention efficacy literature being carried out at the Early Intervention Research Institute at Utah State University (see White, 1986, for a description of the larger database from which these studies were identified). Each of these studies was coded as to the way in which parents were involved in the intervention program. As shown in Table 1, the types of parent

Table 1

Type of Parent Involvement in Early Intervention Programs

	Parent Assistance to Child
Parent as Therapist:	Parent teaches developmental skills (e.g., motor, language, self-help) to the child.
Parent/Child Relations:	Parent engages in activities to enhance attachment, bonding, etc., with the child.
Sensory Stimulation:	Stimulation of the senses via activities such as spinning, rolling, or stroking.
Parent as Classroom Aides:	Parent serving as classroom aides for their own and other children.
	Help to Parents/Family
Emotional Support:	Providing psychological service, counseling, and/or support groups for parents and family.
Resource Access:	Assisting parents and family members to access available community and government resources such as child care, medical care, nutrition, and housing.
Parenting Skills:	Teaching parents generic child management skills, teaching values, etc.
Job Training:	Providing education to parents in job-related skills.
Respite Care:	Providing education to parents in job-relating skills.
Knowledge of Child Development:	Teaching parents about general child development (e.g., Piagatian stages, motor milestones, psychological states, etc.)

involvement used in past research can be divided into two broad categories: (1) programs where the parent was used in some way to provide assistance to the child; and (2) programs where some sort of assistance was provided to the parent or other family members. Within in each of these broad categories, more specific types of parent involvement can be identified. Each of the 10 types of involvement shown in Table 1 were present, alone or in combination with others, in past research studies. For each study included in our analysis, a judgment was made as to what the primary focus of parent involvement was in that particular study. For example, consider a study where parents were trained to provide daily physical therapy to their child with specific routines, behavioral objectives, and evaluation criteria; in addition to being invited to a parent support group which met once each month. Such a study would be coded as having a primary focus of using parents as therapists, with the supplementary aspect of providing emotional support to the parents.

Figure 1 shows the percentage of the 172 studies included in this analysis which used each type of parent involvement. As can be seen, using parents as therapists was by far the most frequent way in which past research has defined parent involvement. In other words, in 80% of the studies we analyzed, parents were used as therapists as either the sole focus or as the major focus of a parent involvement program which involved several other components. Assistance to the parents or other family members was seldom the major focus of parent involvement programs. This pattern was consistent whether the studies were done with children who are disabled, at-risk, or disadvantaged.

Regardless of which conceptual or theoretical definitions of parent involvement associated with early intervention are currently in vogue, the actual practice of parent involvement establishes the context for deciding whether there are benefits associated with involving parents in early intervention programs. Based on this analysis of why parents are actually involved in the early intervention programs reported in the literature, we next consider the ways in which it has been suggested that parent involvement can be beneficial.

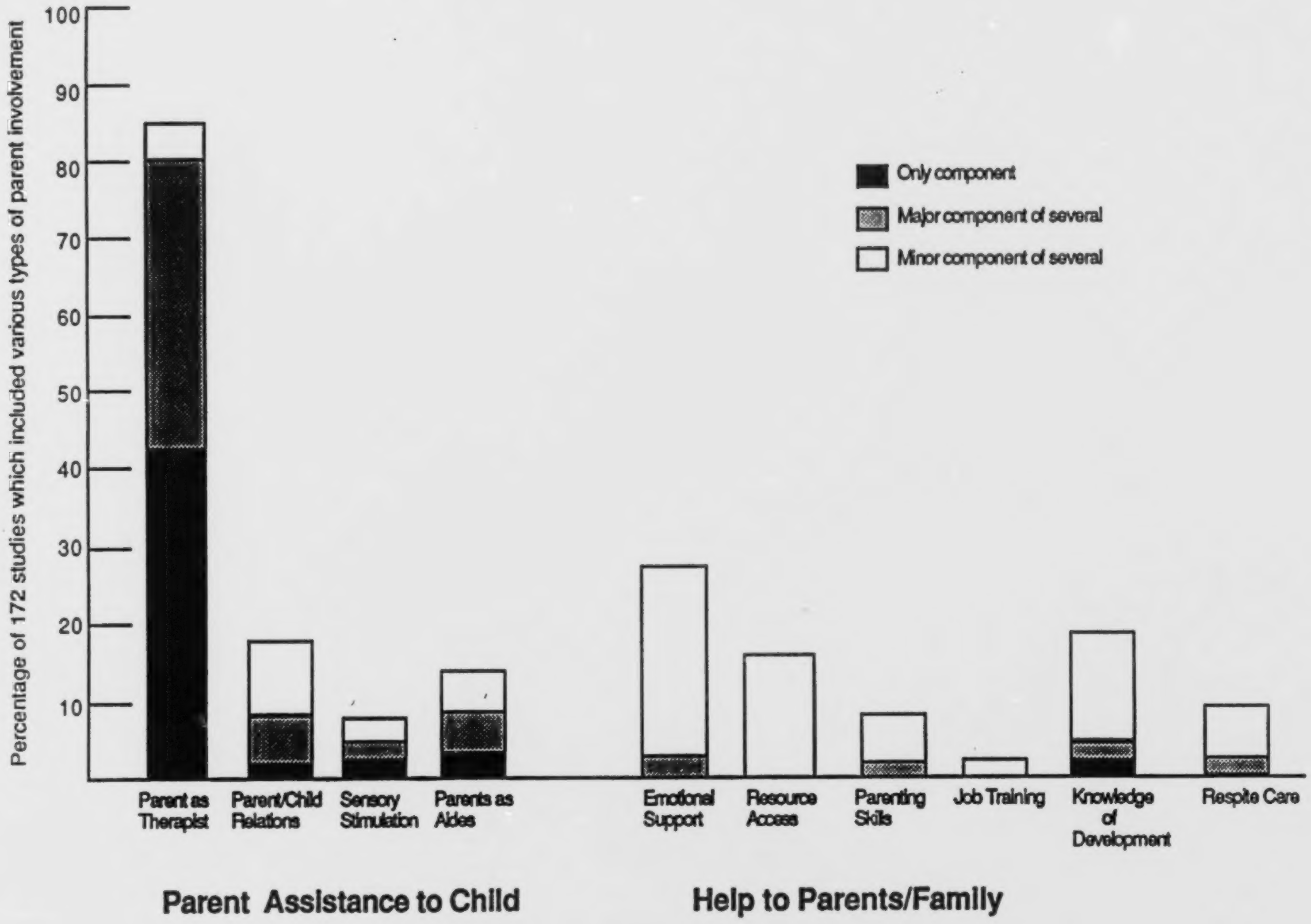

Figure 1. Frequency With Which Different Types of Parent Involvement are used in Research Studies.

Why is it Important to Involve Parents in Early Intervention Programs?

Using the discussion by Peterson and Cooper (1989) of the needs addressed by involving parents in early intervention programs in conjunction with our analysis of the ways in which parents were actually involved in the 172 research studies referred to above, we have identified six rationales that are frequently offered as to why it is important to involve parents. These rationales are summarized below without any intent of judging which one is most appropriate.

- ***Parents are responsible for the welfare of their children***. Most parents want to have a voice in how their child is educated since they are ultimately responsible for the well being and welfare of the child. Some argue that even if they wanted to relinquish that responsibility to schools or government agencies, they should not be allowed to do so.

- ***Involved parents provide better political support and advocacy***. Some claim that if parents are knowledgeable about early intervention programs and have first-hand information about how they operate and have observed the associated benefits, they will be in a much better position to advocate for the further growth and support of those programs. Those who take this position argue that even if programs have very good evidence of benefiting children, it is absolutely essential in times of fiscal restraint to make sure that a broad constituency understands and supports the continued growth and funding of those programs.

- ***Early intervention programs which involve parents are more effective***. It is often alleged that by involving the family, which is where the child spends the majority of his or her time, the benefits of early intervention programs can be reinforced and strengthened. Some people also believe that the first years of a child's life are the most critical for learning and development; consequently, the parents are in a unique position to provide the child with appropriate intervention during this time. According to this position, parent involvement is particularly important if the possibility exists that parents might unknowingly be working at cross-purposes with the professionals in the early intervention program.

- ***By involving parents, the same outcome can be achieved at less cost***. Early intervention requires a great deal of small group or one-to-one intervention time. Such services can be very expensive. If parents can be used to deliver a portion of the services, it is often suggested that the costs of early intervention can be dramatically reduced.

- ***The benefits of early intervention are maintained better if parents are involved***. Many people believe that early intervention cannot be successful unless a systematic effort is made to reinforce and build upon the benefits which are achieved during the initial program. It is often argued that the best way to systematically continue to reinforce these benefits is to use parents, since they are the only ones who will be consistently involved with the child. Responsibilities of agencies may change, the family may move, funding may be cut, but the child will always be a member of his/her family.

- ***Parent involvement provides benefits to parents and family members as well as the child***. By helping parents to understand their child's current situation and potential, and to understand how to manage their child's needs and demands, it is often claimed that parents will have reduced levels of stress, more satisfaction, and a more realistic perception of what is possible and desirable. Participation in early intervention programs also exposes parents to other agencies and services which may be useful to them in other aspects of their life.

If parent involvement is advocated as an essential part of early intervention programs because of a conviction that parents are ultimately responsible for the welfare of their children, or because the program is trying to build an advocacy network to strengthen political and community support; then evidence concerning the benefits for children or parents of such involvement is irrelevant. If, however, parent involvement is being done because it is believed that there are benefits for participating children or parents, or that the same benefit can be achieved at less cost, or that benefits are more likely to be sustained over time; then it is essential to evaluate the available evidence to decide whether such claims can be supported. Such evidence is considered next.

Evidence Concerning the Benefits of Parent Involvement In Early Intervention Programs

Three sources of information are useful in deciding whether currently available evidence supports claims about the benefits of parent involvement in early intervention programs. As mentioned earlier, dozens of previous reviews have concluded that parent involvement is beneficial. How strong is the evidence from those reviews? Also, hundreds of early intervention studies have been done. If those studies which involved parents typically find stronger effects for participating children and families than those studies which do not, it would provide some evidence in support of the benefits of involving parents. Third, a few studies have made direct comparisons of the effects of involving parents vs. not involving parents in early intervention programs. How good is the evidence from these studies? The evidence from each of these sources is considered next.

Conclusions of previous reviewers. Virtually all previous reviewers who have examined the benefits of involving parents in early intervention programs have concluded that parent involvement is valuable (see White et al., 1985-86, for a summary of these reviewers' conclusions). An important question is whether the evidence on which these conclusions are based is credible. To answer this question, we selected widely-cited reviews of the early intervention efficacy literature which have specifically addressed the issue of parental involvement. The reviews include those written by Bronfenbrenner (1974), the Comptroller General (1979), Datta (1971), Floren & Dokekci (1983), Karnes and Lee (1978), and Lazar and Darlington (1982).[3]

The conclusions of these reviewers regarding parent involvement are notably consistent, as indicated below.

> Without family involvement, intervention is likely to be unsuccessful, and what few effects are achieved are likely to disappear once the intervention is discontinued. (Bronfenbrenner, 1974, p. 300)
>
> The most effective programs are those where the child participates at a very young age, and where parents are closely involved in the programs. (Comptroller General, 1979, p. 30)
>
> Parents should be deeply involved in the design and implementation of local programs. (Datta, 1971, p. 67)
>
> We found a cluster of five interrelated program characteristics related to positive outcomes....Direct participation by parents--the more the better. (Lazar & Darlington, 1982, p. 305)
>
> The results from objective measures of school achievement have not been consistent in all areas; however, one can conclude on the basis of a limited sample that parent education programs can improve children's ability to meet the minimal requirements of schools. (Florin & Dokecki, 1983, p. 43)
>
> Parents and other family members play a significant role in promoting, reinforcing, and sustaining gains made during the preschool years. To

---

[3] *Although Lazar and Darlington (1982) is really not a review of the literature, it is widely cited in other documents as being a review. Actually, it is a report of a consortium of longitudinal studies which collaborated in pooling much of their data to address similar issues. It is included in this group of reviews because it is widely cited as a review, and is more like a review than it is like an individual research study.*

> prevent the handicapped child's regression to a lower stage of development, parent involvement is a must....No program for young handicapped children can be considered exemplary unless parents are actively involved. (Karnes & Lee, 1978, p. 14, 19)

As is evidenced from these conclusions, most statements about the value of parent involvement in early intervention are apparently not intended to address the issue of whether parents can be successful teachers of their children. Most statements about the value of parent involvement in early intervention programs, including these, imply that some type of program already exists, and that the addition of a parent involvement component will result in the program being more effective than if the parent involvement component had not been added. Although it may well be true that parents can be effective teachers of their children, that is a different issue than whether or not early intervention programs are more effective if parents are involved. The issue of whether parents can be effective teachers of their children is specifically not addressed by our analysis.

To examine the credibility of evidence on which conclusions of these six reviewers regarding benefits of involving parents were based, we identified original research studies which were cited in support of the conclusions about parent involvement in each of the reviews. Research studies cited by each review are listed in Table 2. As can be seen, the number of studies cited in support of the conclusion that parent involvement is beneficial for early intervention programs ranged from 14 in the Comptroller General's (1979) report to zero in Datta's (1971) report.

We next obtained each of the studies cited by these reviewers to determine whether the evidence from these studies supported the claims regarding the benefits of parent involvement in early intervention programs. Table 3 shows the results of this analysis which suggests that the conclusions of these reviewers should be viewed with caution. For example, only three of the studies, two of which were judged to be of poor methodological quality, involved a direct test of whether an early intervention program is more effective when parents are involved than when they are not involved (Gilmer, Miller, & Gray, 1970; Karnes et al., 1970; and Radin, 1972).

Table 2
Research Studies Cited by Prominent Reviewers in Support of the Conclusion that Parent Involvement Contributes to More Effective Early Intervention Programs

	Reviewers					
	Bronfenbrenner	Karnes	Florin & Dokecki	Comptroller General	Data	Lazar
Beller (1979) The Philadelphia Project				X		X
Deutsch et al. (1974) (IDS) Institute for Developmental Studies				X		X
Gilmer, Miller, & Gray (1970)	X		X			
Gordon (1971) The Parent Education Program	X	X	X	X		X
Gray & Klaus (1970) The Early Training Project	X	X	X	X		X
Gray & Ruttle (1976) The Family Oriented Visiting Program				X		
Karnes et al. (1969) The Curriculum Comparison Project		X	X	X		X
Karnes, Teska, & Hodgins (1970)	X	X				
Levenstein (1970) The Verbal Interaction Project	X	X	X	X		X
Levenstein & Sunley (1968)	X					X
Love et al. (1976) National Home Start Evaluation			X			
Miller & Dyer (1975) Curriculum Comparison Project				X		X
Palmer & Siegel (1977) The Harlem Training Project				X		X
Radin (1971)	X		X			
Sprigle (1974) Learning to Learn Program			X			
Weikart, Bond, & McNeil (1978) The Perry Preschool Project			X	X		X
Weikart et al. (1978) The Curriculum Demonstration Project				X		
Weikart & Lambie (1969) Ypsilanti-Carnegie Infant Education Project		X		X		X
Woolman (1971) The Micro-Social Learning System				X		X
Zigler & Trickett (1978) The New Haven Follow Through Study				X		X

Table 3

Studies Cited by Prominent Reviewers in Support of the Benefits of Parent Involvement in Early Intervention

	Nature of Research Population	Major Focus of Parent Involvement	Supplementary Aspect(s) of Parent Involvement	Quality of Study	Effect Size Attributable to Parent Involvement*	Were Program Costs Analyzed?
DIRECT TEST OF WHETHER IT IS BENEFICIAL TO INVOLVE PARENTS IN EARLY INTERVENTION						
Gilmer, Miller, & Gray (1970)	Disadvantaged	Parent as Therapist	---	Poor	37	No
Karnes, Teska, & Hodgins (1970)	Disadvantaged	Parent as Therapist	Emotional Support	Poor	26	No
Radin (1972)	Disadvantaged	Parent as Therapist	Parenting Skills	Fair	12	No
INDIRECT TEST OF WHETHER IT IS BENEFICIAL TO INVOLVE PARENTS IN EARLY INTERVENTION						
Love et al. (1976) National Home Start Evaluation	Disadvantaged	Parent as Therapist	Emotional Support, Child Dev., Job Training/Education	Poor	0	Yes
Miller & Dyer (1975) Curriculum Comparison Project	Disadvantaged	Parent as Therapist	---	Fair	33	No
Sprigle (1974) Learning to Learn Program	Disadvantaged	Parent as Therapist	Parent/Child Relations	Poor	99	No
IS CENTER-BASED INTERVENTION WHICH INVOLVES PARENTS BETTER THAN NOTHING?					Effect size attributable to intervention vs no intervention	
Gordon (1971) The Parent Education Program	Disadvantaged	Parent as Therapist	Parent/Child Relations, Sensory Stimulation, Emotional Support	Good	42	No
Gray & Klaus (1970) The Early Training Project	Disadvantaged	Parent as Therapist	Parent/Child Relations, Sensory Stimulation, Emotional Support	Good	24	No
Weikart, Bond, & McNeil (1978) The Perry Preschool Project	Disadvantaged	Parent as Therapist	---	Good	27	Yes
Weikart et al. (1978) The Curriculum Demonstration Project	Disadvantaged	Parent as Therapist	---	Poor	2.51	No
Woolman (1971) The Micro-Social Learning System	Disadvantaged	Parent as Class Aide	---	Poor	95	No
IS PARENT DELIVERED EARLY INTERVENTION BETTER THAN NOTHING?						
Gray & Ruttle (1976) The Family Oriented Visiting Program	Disadvantaged	Parent as Therapist	Parent/Child Relations, Parenting Skills, Child Dev. Education	Poor	43	No
Levenstein & Sunley (1968)	Disadvantaged	Parent as Therapist	---	Poor	95	No
IS EARLY INTERVENTION WHICH DOES NOT INVOLVE PARENTS BETTER THAN NOTHING?						
Beller (1969) The Philadelphia Project	Disadvantaged			Fair	27	No
Deutsch et al. (1974) Institute for Developmental Studies	Disadvantaged			Good	36	No
Karnes et al. (1969) The Curriculum Comparison Study	Disadvantaged	N/A	N/A	Fair	42	No
Palmer & Siegel (1977) The Harlem Training Project	Disadvantaged			Fair	31	No
Zigler & Trickett (19[illegible]) The New Haven Follow Through Study	Disadvantaged			Fair	75	No

* *Note:* *Throughout this paper, "effect size" is defined, consistent with Glass (1976), as the mean score of the first experimental group minus the mean score of the second experimental group, divided by the pooled standard deviation of the groups; i.e.,* $(x_1 - x_2) \div SD = ES$.

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By a "direct test" we mean a study in which outcomes for at least two groups of children are compared; one which participated in an early intervention program without significant parent involvement, and the other which participated in the same early intervention program with the addition of a parent involvement. Any differences between the groups on outcome measures would theoretically be due to the fact that one group had parent involvement while the other did not. Only one of the three studies which included a direct test of the hypothesis found a positive effect associated with involving parents, and Karnes et al. (1970) and Radin (1972) found that children who participated in the group involving parents more actually performed worse than the children participating in the group that did not involve parents or involved them only to a minor degree. The methodological weaknesses in all of these studies limits the credibility of these results. However, if the results were accepted at face value (which is not something we would advocate), they would suggest that parent involvement has mixed results--more often negative than positive.

Three additional studies cited in Table 3 provided an indirect test of the hypothesis that early intervention is more effective if parents are involved (Love et al., 1976; Miller & Dyer, 1975; Sprigle, 1974). In these studies, two or more alternative types of early intervention programs were compared. The test is indirect because the alternative intervention strategies varied in more ways than just the presence or absence of a parental involvement component. For example, Miller and Dyer (1975) compared the effects of participating in a Bereiter-Englemann, Montessori, DARCEE, or traditional early intervention program. Only the DARCEE program (modeled after the work of Gray and Ruttle, 1976) involved a substantial parent involvement component. The indirect test of the hypothesis that parent involvement is beneficial comes from a comparison of the results from the DARCEE program to the results of the other three programs. The reason it is an indirect test is because it is impossible to sort out whether any differences between groups on outcome measures are attributable to the presence or absence of parent involvement, or to other differences among the programs such as philosophical approach, class size, or other aspects of the curriculum. In the Miller and Dyer (1975) study, those children in the group which involved parents actually did worse than children in the other three groups. In the Sprigle (1974) study, children in the group with parent involvement did substantially better, whereas in the Love et al. (1976) there was no difference between the groups.

The other 14 studies cited by these reviewers provide little, if any, information on the question of whether early intervention is more effective if parents are involved. Five of the studies provide evidence that children in a center-based intervention which involves parents perform better than children who receive no intervention; four of the studies provide evidence that children who participate in early intervention programs delivered primarily by their parents do better than children who receive no intervention; and five of the studies did not even involve parents.

It is also important to note that none of the studies cited by these particular reviewers even examined whether any alleged effects for children are maintained over time or whether there were benefits for other family members. Furthermore, none of them provide evidence that it is more cost-effective to involve parents in early intervention programs. In fact, only two of the studies even collected data about costs (Love et al., 1976; Weikart et al., 1978), and neither of these directly addressed the cost-benefit issue of parent involvement. It is also interesting to note that all of these studies were conducted with children who are disadvantaged, even though some of the reviewers drew conclusions about children who are disabled. Whether the results of studies with children who are disadvantaged would even apply to children who are disabled is debatable. Given the severe developmental lags, management problems, and stress associated with having children with disabilities as compared to children who are disadvantaged, it would seem that the effectiveness of a particular type of parent involvement program might vary substantially for children who are disadvantaged or disabled. Finally, it is instructive to consider the nature of the parent involvement in those 15 studies which involved parents in a substantial way. As can be seen in Table 3, all but one of the studies focused primarily on using parents as therapists, and almost no effort was made in these studies to assist parents or other family members.

The fact that the majority of past research has focused only children who are disadvantaged, has been of relatively poor methodological quality, and has implicitly defined parent involvement only as using the parent as a supplemental therapist should make us more cautious about the conclusions of previous reviewers that involving parents will result in more effective early intervention programs. Irrespective of these caveats, the information in the studies cited by these reviewers does not support the position that parent involvement contributes to more effective early intervention programs in any of the four ways cited earlier (i.e., benefits for children, better maintenance of effects, the same effects at less cost, or benefits for family members).

Are early intervention programs which involve parents more effective than those that do not? Hundreds of studies have compared the effects of some type of early intervention program to a no-treatment control group. One source of information which may explain why so many people believe that it is beneficial to involve parents in early intervention programs may come from comparisons of the results of all of the intervention vs. no intervention studies which involved parents to the results of all of the intervention vs. no intervention studies which did not involve parents. This can be done by examining the average effect size of such intervention vs. no intervention studies for those studies where parents were involved and those studies where parents were not involved in the intervention. If parent involvement contributes to more effective early intervention programs, one would expect the average effect size for studies involving parents to be larger than the average effect size for studies which did not involve parents.

Evidence of this nature is available in a data base at the Early Intervention Research Institute at Utah State University which describes the characteristics of previous studies of early intervention effectiveness. Over 350 different studies have been collected; each of the studies has been analyzed with respect to the nature of the intervention that was implemented, the characteristics of participating children and families, the methodological quality of the study, the type of outcome measures which were collected, and the results of each study defined as a standardized mean different effect size. One of the variables coded for each study was the degree to which parents were involved in the early intervention program. Table 4 reports the average effect size for 193 intervention vs. no intervention studies of center-based programs--some of which involved parents and some of which did not. Of course, the validity of such a comparison depends on the assumption that all other variables that might have affected outcomes are equally balanced between the two groups. For example, suppose that the earlier a child starts an early intervention program, the larger the effect of the program will be (a widely-held assumption about early intervention). If most of those programs which had extensive parent involvement also started earlier, then there might be an apparent advantage for programs with extensive parent involvement which is really attributable to the fact that the children started earlier. We have checked for the presence of such confounding for the data in Table 4 and have found none (see White et al., 1985-86, for a more detailed explanation of this analysis). However, with so many different variables that are possibly related to the effects of early intervention, it is difficult to be sure that such confounding does not exist. Thus, one must view these data with caution. In spite of the possibility of confounds, these data are important to examine because of the possibility that they may be the source of the widely-held belief that parent involvement leads to more effective early intervention programs.

For the 83 studies with disadvantaged children judged to be of good methodological quality, children participating in programs with moderate to extensive

Table 4

Immediate Benefits of Parent Involvement in Center-Based Early Intervention Programs (Average Effect Size for Different Levels of Parent Involvement in 193 Studies)

	Studies of Good Methodological Quality (83 Studies)		Studies of Poor Methodological Quality (122 Studies)	
	Degree of Parent/Family Involvement			
	Extensive/ Moderate Involvement	Little/No Involvement	Extensive/ Moderate Involvement	Little/No Involvement
Disadvantaged Children	.52 89 (14)	.53 140 (29)	1.24 33 (9)	.62 177 (45)
Handicapped Children	.43 41 (8)	.65 32 (12)	.78 117 (45)	.92 56 (24)
At-Risk Children	.30 10 (4)	.32 41 (19)	*	.70 9 (5)

NOTE: Numbers below the average effect size (ES) in each cell indicate the number of ESs and the number of studies (in parenthesis) on which each calculation is based. Averages based on less than four studies are not reported.

* *Averages based on fewer than 4 studies are not reported.*

parent involvement showed the same benefits compared to no treatment control groups, as children participating in programs which had little or no parent involvement. The same is true for children who are disabled and at-risk.

Similar results are shown in Table 5, which summarizes the results of 43 intervention vs. no intervention studies for home-based early intervention programs in which parents are the major or only provider and those programs where the parent is involved in a minor degree or not at all. For children who are disadvantaged,

Table 5

Immediate Benefits of Parent Involvement in Home-Based Early Intervention Programs (Average Effect Size for Different Levels of Parent Involvement in 43 Studies)

	Studies of Good Methodological Quality (21 Studies)		Studies of Poor Methodological Quality (24 Studies)	
	Degree of Parent/Family Involvement			
	Major or Only	Minor or Not	Major or Only	Minor or Not
Disadvantaged Children	.49 30 (7)	.66 30 (8)	.28 17 (5)	.74 15 (4)
Handicapped Children	.99 14 (6)	*	1.10 30 (15)	*

NOTE: Numbers below the average effect size (ES) in each cell indicate the number of ESs and the number of studies (in parenthesis) on which each calculation is based. Averages based on less than four studies (those for at-risk children and those for handicapped children where parents were involved to a minor degree or not at all) are not reported.

there is no advantage for those home-based programs in which parents are more heavily involved. For children with disabilities, there was not sufficient information to make such a comparison, since very few studies of home-based intervention with children with disabilities have been done in which parents were not extensively involved.

In summary, we can find no evidence that intervention vs. no intervention studies which have involved parents are any more effective than similar studies which do not involve parents. Furthermore, we have found no evidence to suggest that programs which involve parents are any more cost-effective or maintain benefits any more than those that do not involve parents. Admittedly, the potential for confounding variables to obscure true relationships in a data set of this nature is great. Furthermore, as shown by the data reported earlier in Figure 1, most of these studies have focused primarily or even exclusively on using parents as therapists instead of involving them in other ways. Thus, it would be inappropriate to conclude, based on these data, that parent involvement in early intervention is not beneficial. Just as important, however, is the need to make a clear statement that no evidence exists in this type of data to argue that parent involvement in early intervention will lead to any of the benefits that are often claimed for children or families.

Experimental manipulation of the effects of parent involvement. The best information about the effects of parent involvement comes from the limited number of studies which have experimentally addressed the issue of whether early intervention will be more effective if parents are involved. In other words, within the same study, some children were in a group with parent involvement, and others were in a group without parent involvement. Such studies can be categorized as to whether the degree of parent involvement is the only variable which is experimentally manipulated (what we will refer to as a *direct comparison*), or whether parent involvement is one of several variables (e.g., setting, age-at-start, nature of curriculum materials) which distinguish between the two groups (what we will refer to as an *indirect comparison*).

An example of a direct comparison would be a study in which children in a center-based program which includes parent involvement are compared to children in the same center-based program without parent involvement. In this case, the presence or absence of parent involvement is the only variable which differentiates the independent variable for the two groups of children. An indirect comparison would be one where parents are more heavily involved in the one group than in the other group, but there are also other differences between the two groups. For example, Barnett, Escobar, and Ravsten (1987) reported a study which compared a home-based intervention with parents acting as the child's therapist vs. a center-based intervention where speech therapists provided the intervention. In this case, it is difficult to know whether the differences between the groups is attributable to the fact that parents were more heavily involved in one group than the other, whether it was the setting in which the intervention took place (home vs. center), or whether it was the differences in the curriculum used in each of the groups.

Table 6 summarizes all of the direct and indirect comparisons of degree of parent involvement we have been able to locate. As can be seen, there are 16 different studies for children with disabilities, 13 for children who are disadvantaged, and 2 for children who are at risk. We believe that the information from the indirect comparisons is so confounded with other variables that there is little, if any, information which is useful in determining whether it is beneficial to involve parents in intervention programs. Nonetheless, since these studies are sometimes cited in the support of involving parents in early intervention programs, we thought it was important to include them, even though we believe the information is of little use. The important information comes from those studies in which a direct comparison is made.

As can be seen in Table 6, there are no good quality studies with children with disabilities. Two studies (Barnett et al., 1987; Henry, 1977) which were judged to be fair methodologically, found small to moderate benefits associated with parent involvement. The Barnett et al. (1987) study was with children with speech impairments. The largest effects were found by Henry (1977) who added a parent as therapist component to one group of children in a daycare program while the other children continued to receive just the daycare. This is quite different from most studies of early intervention since the children were not already enrolled in a comprehensive center-based early intervention program. Although more research is

Table 6
Effects of Adding a Parent Involvement Component to Early Intervention

Reference	Description of the Comparison	Study Quality	Primary Focus of Parent Involvement	Supplementary Aspects of Parental Involvement	Average ES for	
					Child	Parent
STUDIES WITH HANDICAPPED CHILDREN						
DIRECT COMPARISONS OF BENEFITS OF PARENT INVOLVEMENT:						
Barnett, Escobar, & Ravsten, 1987	Center and home intervention vs center intervention	fair	Parent as therapist	---	.26	
Henry, 1977	Daycare program plus parental training vs daycare program alone	fair	Parent as therapist	---	.72	
Minor et al., 1983	Center-based intervention plus parental involvement vs center-based intervention alone	poor	Parent as therapist	---	2.21	
Miller, 1981	Preschool developmental class plus at-home program vs preschool developmental class alone	poor	Parent as therapist	Parent/child relations Emotional support Resource Access	.16	
Scherzer et al., 1976	Physical therapy plus parent training vs physical therapy alone	poor	Parent as therapist	---	.50	
INDIRECT COMPARISONS OF BENEFITS OF PARENT INVOLVEMENT:						
Eiserman, 1988	Teaching parents to do speech therapy with children vs therapists providing services to children	good	Parent as therapist	---	.10	.04
Bidder et al., 1975	Parent as therapists vs home-based intervention by health care professional	good	Parent as therapist	Emotional support	1.07	
Barnett, Escobar, & Ravsten, 1987	Home-based intervention by parent vs center-based intervention	fair	Parent as therapist	---	.19	
	Center plus home-based intervention vs home intervention	fair	Parent as therapist	---	.15	

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needed, it is not implausible that using parents as therapists in conjunction with a daycare program would result in significant gains because children are receiving little if any educational intervention. Whereas, adding a parent involvement component to a good center-based early intervention program has little effects on children because they are already making most of the developmental growth they are capable of making as a result of the center-based program. Other studies with children with disabilities were judged to be of poor methodological quality and found effects ranging from small to large.

For children who are disadvantaged, we could find only one good-quality study and one fair-quality study in which a direct comparison was made of the effects of involving parents in early intervention programs. Both of these (Casto & White, 1987; Radin, 1971) used parents primarily as therapists for their children. Both found that children participating in early intervention programs without parent involvement actually did better than those participating in programs with parent involvement. Although the information from studies of lower methodological quality is less useful, it is not inconsistent with the results of the two studies of better methodological quality. In other words, of the seven other comparisons, three find negative effect sizes, two relatively small benefits, and two moderately large benefits associated with involving parents in early intervention programs. Again, almost all of the studies with children who are disadvantaged have used parents as therapists for their children rather than providing other forms of parent involvement.

Conclusions

Although there is broad-based consensus that early intervention programs which involve parents will be more effective than those programs which do not, there is remarkably little evidence for this position. The evidence cited by prominent reviewers of the early intervention research literature is largely contradictory or irrelevant to the hypothesis that programs will be more effective if parents are involved. Average effect sizes of treatment vs. no treatment studies in which parents are involved are about the same as the average effect sizes of treatment vs. no treatment studies in which parents are not involved. Finally, the results of direct comparisons for children who are disadvantaged and disabled suggest that the benefits of involving parents in early intervention programs, at least in the way they have been involved heretofore, is non-existent or very small.

Unfortunately, much of the data to date comes from studies of relatively poor methodological quality, and the type of parent involvement about which we have results from experimental studies is limited almost exclusively to those programs where the primary type of parent involvement was to use them as therapists for their children. There is relatively good data that the use of parents as therapists for their children has negligible benefits for children with moderate to severe disabilities already participating in a center-based early intervention program. For children with speech impairments, there is some evidence, although it is very limited at this point, that a parent involvement component may have some additional benefits. For children who are disadvantaged, less high-quality data is available, but the best studies suggest that the addition of parent involvement to existing early intervention programs, at least as parent involvement has been defined in past research, is of no benefit. For children who are at risk, little research concerning parent involvement has been done, and no direct comparisons of the benefits of involving parents could be found.

Our conclusion from all of the preceding data is that persuasion and politics about the benefits of parent involvement in early intervention programs have gone far beyond the available scientific evidence. It may well be that certain types of parent involvement contribute to more effective early intervention programs for children who are disabled, disadvantaged, and at-risk. To date, however, we can find no credible scientific support for benefits of the nature described by prominent researchers, policy makers, or administrators. More specifically, there is no evidence that the type of parent involvement used in past research studies has led to greater benefits for children, most cost-efficient programs, better maintenance of effects, or benefits for other family members.

The fact that existing laws mandate the involvement of parents in early intervention programs for children who are disabled and at-risk does not mean that we should not continue to examine what types of parent involvement are most beneficial for children and families. It may be that the best type of parent involvement for children with disabilities is to provide respite care, invitations to a support group, and the involvement of parents in developing their child's Individualized Educational Program. Alternatively, it may be that more active involvement is necessary to accomplish the types of benefits that many people have claimed are associated with parent involvement.

The studies of parent involvement included in the **Longitudinal Studies** are designed to address the issues raised by the analysis of previous research. We have focused primarily on experimental manipulations which involve parents in the way they have been used most extensively in previous research (i.e., primarily as therapists with some emphasis on emotional support and knowledge of child development). In the remainder of this section, we present the results of five studies which investigated issues related to involving parents in early intervention programs.

Also included in this section is a sixth study which compared the effects of using different modes of communication (Total vs Oral) for preschoolers with hearing impairments. Since this study is unique in many ways, it contains its own review as a part of the report.

DES MOINES PUBLIC SCHOOLS

Project #12

COMPARISON: Mildly to Severely Handicapped Children -- Center-based intervention plus parent involvement vs. center-based intervention only

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LOCATION: Des Moines, Iowa

DATE OF REPORT: 4-10-1991

Rationale for the Study

Parent involvement is often considered an important part of early intervention programs for young children with disabilities. This belief is so strong that it has been incorporated into the law mandating services for these young children (P.L. 99-457). Unfortunately, the empirical support for this belief is not as clear as one might assume based on the P.L. 99-457 mandate (White et al., 1989). Concerns have been raised regarding the efficacy of parent involvement in general and, specifically, to what types of parent involvement are most beneficial to children and families (Casto & Mastropieri, 1986; White, Taylor, & Moss, 1989). This study examined the effects of adding one particular type of parent involvement to an existing center-based early intervention program for children with disabilities. The type of parent involvement program investigated as a part of this study included weekly parent meetings which focused on: a) training parents to work with their children on skills/behaviors, b) educating parents in various topics, and 3) providing support to parents in the form of parent groups and assistance in accessing available resources.

Review of Related Research

The issue of parent involvement in early intervention has been a subject of many reviews of literature (Bronfenbrenner, 1974; Comptroller General, 1979; Datta, 1971; Floren & Dokekci, 1983; Karnes, 1978; Lazar & Darlington, 1982). These reviews have almost unequivocally stated the necessity of involving parents in early intervention for their child. In examining the research studies cited by these reviews, White et al. (1989) found that the individual results did not support the conclusions of the reviews. White et al. raised further concerns by concluding that the research cited in these reviews had focused only on children who are disadvantaged, were of relatively poor methodological quality, and had defined parental involvement only as using the parent as a supplemental therapist.

White et al. (1989) raised two concerns that are relevant to this study. (1) What are the effects of parent involvement programs on young children with disabilities and on their families? (2) What is the most effective way to define and implement parent involvement programs for parents of children with disabilities?

White et al. provided some information regarding the first question. Using data that had been prepared for a meta-analysis of early intervention (Casto & Mastropieri, 1986), White et al. compared effect sizes from 89 studies that used children with disabilities as subjects. All these studies included some type of parent involvement. These studies were divided into two categories for analysis: studies that included extensive/moderate parent involvement and those that included little/no parent involvement. The results of this analysis were equivocal with respect to degree of parent involvement (i.e., more parent involvement was not necessarily better). It should be made clear that not all these studies were examining parent involvement, only that these studies included parent involvement and the parent involvement could be coded.

Studies (from the above analyses) that specifically investigated the effect of parental involvement in early intervention for children with disabilities were individually examined. Unfortunately, the majority of these were indirect comparison, confounded by differences in the interventions being compared. Only five studies were found, other than those being conducted by EIRI, that directly compared parent involvement with no parent involvement (Barnett et al., 1987; Henry, 1978; Miller, 1981; Minor et al., 1983; Scherzer et al., 1976). Although all these studies report positive effects of parent involvement, research methodology problems existed. In all these studies, parents were trained to provide some type of therapy.

In regard to the second question raised earlier, parent involvement has been defined by Peterson and Cooper (1989). They delineate six aspects of parent involvement programs: (1) information provision, (2) professional partnership, (3) support network, (4) training, (5) respite care, and (6) informal contact with staff. Although these aspects may overlap, studies primarily focus on a single aspect. Additionally, different parent involvement foci require different types of data for evaluation. Gatling and White (1987), in a review of 172 parent involvement studies, found that over 80% of studies focus on parent training (i.e., training parents to act as an intervenor or therapist for their children) as either the sole or major focus of the parent involvement program. This focus requires data on child outcomes to gauge effectiveness.

Another issue that has been overlooked in the majority of research on parent involvement are issues related to changes that may occur in the family. If using an ecological model (Bronfenbrenner, 1979; Dunst, 1986), parent involvement activities may affect aspects of family functioning that may impact on the child's later development and functioning (see Blacker, 1984; Kaiser & Fox, 1986), even though immediate child effects may not occur. For example, families of children with disabilities are likely to be highly stressed (Gallagher, Beckman, & Cross, 1983) and in possible need of assistance to continue functioning as a "normal" family unit. Parent involvement activities may reduce this stress. Unfortunately, research on the efficacy of parent involvement programs have not included the assessment of possible impact on family functioning.

As emphasized by the preceding brief review, there are a variety of unclear efficacy issues surrounding parent involvement that require examination. Problems in the parent involvement literature include equivocal effects from studies examining different levels of parent involvement on child developmental progress. Few studies have occurred that are free of treatment confounds, and methodological problems make the results of these studies suspect. Parent involvement has not been clearly defined across studies; although training the parent to act as an intervenor/therapist for their child is the most common intervention. Finally, most studies have failed to examine family functioning variables. The present study was designed to address these concerns in evaluating the effects of one particular type of parent involvement program.

Overview of Study

The primary curriculum for the parent attended meetings (Parents Involved in Education [PIE]; Pezzino & Lauritzen, 1986) was structured to include that component that had been used most frequently in past research (i.e., training parents as an intervenor/therapist for their child). Providing parents with information and parent support issues were also included in the PIE, but the primary focus was on teaching parents to provide supplemental therapy to their children with disabilities. Interventions similar to the PIE are commonly offered as an addition to an established early intervention program (Gatling & White, 1987). The present study approached the question of parent involvement by comparing the PIE as a supplement to a center-based intervention program versus the effects of the center-based program without the PIE. This study assessed the impact of these interventions on both child progress and family functioning across the time the intervention was in effect, and longitudinally.

In addition, this study investigated the issue of whether parent-attended meetings with a training (PIE I) or support-oriented (PIE II) focus were more efficacious (cf., White et al., 1989). Parent support as an appropriate focus for parent intervention activities is receiving attention and interest in recent literature (e.g., Dunst, 1986; Hanline & Knowlton, 1988; Zeitlin & Williamson, 1988). No comparative information exists on the effect of a parent support intervention on children and families. To provide some preliminary information, parents who participated in PIE and whose children remained in the early intervention program for a second year participated in an intervention focused on parent support (PIE II; Durbala & Hollinger, 1988). Results from parents and children involved in PIE II will allow comparisons to be made between those receiving intervention plus PIE and those receiving center-based intervention only, as well as comparisons of those receiving both PIE and PIE II.

Methods

Subjects participating in this study were served through the Des Moines Public School System. The Des Moines public schools serve all children with disabilities in the Des Moines School District from birth through 6 years of age. (The State of Iowa has had a law mandating a free and appropriate public education to children with disabilities from birth through 5 since 1975.) Children with disabilities in the Des Moines Public Schools ages 0-2 are typically served through home-based intervention programs, while preschoolers with disabilities, ages 3-6, typically receive intervention services in center-based (classroom) settings. The general philosophy of the Des Moines Public Schools is to provide high-quality educational services that maximize each child's individual potential. Programs are developed based on comprehensive individual assessments conducted by members of a multidisciplinary team. Parents are required to participate in the development of Individualized Education Plans.

Subjects participating in this study were served at the Phillips, Findley, and Perkins schools. This represents three of many schools in the Des Moines Public School System in which preschoolers with disabilities are served. These specific schools were selected because teachers and professional support staff (psychologists, speech therapists, occupational therapists, social workers) who work in these schools were interested in conducting this research study in collaboration with EIRI. The liaison at the Des Moines site who was responsible for coordinating the day-to-day activities of the research study was a school psychologist employed by the school district who had responsibilities at each of the three participating locations.

Subjects. The subjects enrolled in this project can be divided into two distinct cohorts (see Figure 12.1). Cohort #1 consisted of those subjects enrolled during the 1986/87 academic year. There were 56 subjects in this cohort (30 control, 26 experimental), 40 of whom were male. The subjects ranged in age from 35 to 72 months at the time they became involved in the research. Cohort #2 consisted of those subjects newly enrolled during the 1987/88 academic year. There were 20 subjects in this cohort (12 control, 8 experimental), 15 of whom were male. The age of subjects in this cohort ranged from 36 to 72 months when intervention began. A subgroup of the first cohort consisted of those subjects who participated in the research for 2 years. This subgroup consisted of 34 subjects (15 control, 19 experimental), 22 of whom were male. These subjects ranged in age from 35 to 61 months when their participation began.

Intervention	n	Fall 86	Spring 87	Fall 87	Spring 88	Spring 89	Spring 90
Only PIE I (Yr. 1)	7	Pre[*]	Post 1[*]		Post 2	Post 3	Post 4
PIE I and II	19	Pre	Post 1		Post 2	Post 3	Post 4
Only PIE I (Yr. 2)	8			Pre	Post 1	Post 2	Post 3
No PIE I (Yr. 1)	15	Pre	Post 1		Post 2	Post 3	Post 4
No PIE I or II	15	Pre	Post 1		Post 2	Post 3	Post 4
No PIE I (Yr. 2)	12			Pre	Post 1	Post 2	Post 3

Figure 12.1: Group Assignment Information and Posttesting Schedule by Academic Year for the Des Moines Study

[*] Pre = Pretest

[*] Post(#) = Posttest (number indicating which posttest)

This report will examine data from all posttests. Posttest #1 included all subjects from the 1986/87 and subjects newly enrolled from the 1987/88 academic years (see Figure 12.1). All subjects had received one year of intervention at Posttest #1. This group was comprised of 76 subjects (42 control, 34 experimental), 55 of whom were male. These subjects ranged in age from 35 to 72 months at the time they began participation in the research. Approximately 75% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive and language impairments. The degree of disability for all subjects ranged from severe to mild. The majority of subjects were mild to moderately delayed, 55% had developmental quotients (based on the BDI Total score) below 65.

Posttest #2 includes subjects who continued in the early intervention program (19 control, 15 experimental) and subjects who "graduated" to school-age programs. Subjects who continued in the program are those who were referred to earlier as the subgroup of the first cohort. The degree of disability for these subgroup subjects varied, and 60% had developmental quotients (based on the BDI Total Score) below 65. Approximately 70% of these subjects demonstrated a developmental delay of unknown etiology characterized primarily by cognitive impairments.

At Posttest #3, all subjects had "graduated" from the intervention program as defined by the research project. At Posttest #3, approximately 75% of the subjects were in elementary school programs. The remaining subjects were in the preschool intervention program. No parent involvement activities, other than those described later in the center-only program, were provided.

Posttest #4 currently includes information for 51 subjects from Cohort #1. Cohort #2 children will not be eligible for Posttest #4 until Spring 1991, because of staggered enrollment dates. All Posttest #4 children were in elementary school programs.

Recruitment. Parents of children in participating schools who were scheduled for preschool placement at the beginning of the academic year were considered for inclusion in the study if the following criteria were met: (a) One parent was not working or the parent could guarantee time off from work (this was done to help ensure parents had time available to attend parent meetings); and (b) the child was not profoundly retarded (preschool program staff were of the opinion that the needs of parents of these children would not be best met through the PIE). Parents of children at the participating schools who met these criteria were individually approached by preschool program staff. Preschool staff described the research and detailed parent and staff requirements. Placement in study group by random assignment procedures was described. If interested, parents returned an informed consent letter that clarified their requirements for participation, research staff obligations, and stated that assignment to groups would be randomly determined. Approximately 95% of the parents who were approached regarding the research agreed to participate.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups prior to the initiation of treatment, either to a group in which parents received the PIE (Center + PIE) or to a group in which parents received no additional involvement other than what was provided to all parents through the center-based program (Center Only). Both groups continued to receive the same level of center-based services that were previously available through the school's program for preschoolers with disabilities.

To increase the probability of having comparable groups, subjects were randomly assigned to groups after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (35-42 months, 43-54 months, and over 55 months) and level of parent motivation (either "high" or "low") as perceived by each child's teacher. Categorizing subjects in this way resulted in subjects falling into one of six mutually exclusive categories. Within each of the six categories, subjects were rank ordered from low to high based on their scores on the CAPER (Continuum of Assessment Programming, Evaluation, and Resources; Carran, 1983). The CAPER, a teacher-administered test of developmental functioning, was administered by school personnel at an earlier date.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination of the first-listed subject (the subject with the lowest CAPER score) in each age by motivation category was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups based on randomly predetermined sequences. Subjects that participated for 2 years remained in the originally assigned group.

Demographic characteristics. Demographic characteristics are described below for subjects participating in each of the posttests. Seventy-six subjects received one year of intervention (Posttest #1). Subjects for this study represented a fairly homogenous sample (see Table 12.1). The majority of subjects were Caucasian males with one sibling. The parents of the subjects were in their late 20s or early 30s and had a high school education. The majority of subjects' families were intact, in that both parents lived at home; and traditional, in the sense that the mother was the primary caregiver. English was the primary language for all families. Family income placed the families as lower to middle class.

Table 12.1 presents data for subjects who received one year of intervention by group on demographic characteristics. Some discrepancies between the Center-Only and Center + PIE groups are indicated. Mothers of subjects in the Center + PIE group tended to be older than mothers of subjects in the Center-Only group, and they also had higher levels of education. Fathers of Center + PIE subjects were much more likely to hold occupations placing them in higher SES categories. In addition, household income for families of subjects in the Center + PIE group tended to be higher than that for Center-Only subjects' families. Thus, in spite of the random

Table 12.1

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	POSTTEST #1								POSTTEST #2							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES~	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES~
● Age of child in months at pretest	53.0	(11.7)	42	52.3	(11.9)	34	.82	-.06	52.0	(11.5)	37	52.0	(11.8)	33	.93	.00
● Age of mother in years at pretest	28.2	(5.6)	40	30.8	(4.8)	33	.03	.46	28.0	(5.9)	35	31.0	(4.8)	32	.05	.51
● Age of father in years at pretest	30.3	(6.8)	33	33.1	(6.1)	27	.12	.41	31.0	(7.0)	28	33.0	(6.2)	26	.24	.29
● Percent Male*	71.4		42	73.5		34	.84	.05	68.0		37	76.0		33	.46	.22
● Years of Education for Mother	11.4	(2.2)	42	12.7	(1.9)	34	.01	.59	11.7	(1.9)	37	12.7	(2.0)	33	.04	.53
● Years of Education for Father	11.8	(2.2)	32	12.8	(2.6)	31	.13	.45	12.0	(2.3)	27	12.7	(2.7)	30	.25	.30
● Percent with both parents* living at home	66.7		42	70.6		34	.72	.10	65.0		37	70.0		33	.67	.12
● Percent of children who* are caucasian	80.5		41	91.2		34	.19	.41	81.0		36	91.0		33	.23	.40
● Hours per week mother employed	6.6	(12.0)	41	5.4	(11.0)	34	.69	-.10	5.0	(10.2)	36	5.3	(11.2)	33	.91	.03
● Hours per week father employed	32.1	(22.6)	27	33.3	(22.3)	29	.84	.05	34.2	(22.4)	23	33.1	(22.6)	28	.86	-.05
● Percent of mothers* employed as technical/ managerial or above	5.0		40	2.9		34	.66	-.13	6.0		35	3.0		33	.60	-.18
● Percent of fathers* employed as technical/ managerial or above	10.3		29	37.9		29	.01	.84	13.0		24	39.0		28	.03	.77
● Total household income	$14,307	($15,496)	39	$21,632	($18,323)	34	.07	.47	$14,309	($15,840)	34	$22,091	($18,408)	33	.07	.49
● Percent with mother as* primary caregiver	95.0		40	97.1		34	.66	.13	94.0		35	97.0		33	.60	18
● Percent of children in daycare	35.9		39	35.3		34	.96	-.01	32.0		34	36.0		33	.73	.10
● Number of siblings	1.3	(0.8)	41	1.5	(0.8)	34	.42	.25	1.3	(0.8)	36	1.5	(0.8)	33	.17	.25
● Percent with English* as primary language	100		41	100		34	---	.00	100		36	100		33	---	.00

(continued)

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

~ $ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

"---" indicates t-test could not be conducted because of no variance in one group.

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Table 12.1 (continued)

Comparability of Groups on Demographic Characteristics for Des Moines Parent Involvement Study

	POSTTEST #3								POSTTEST #4							
	Center Only			Center + PIE					Center Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES**	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES**
● Age of child in months at pretest	52.0	(11.9)	37	52.0	(11.3)	31	.90	.00	51.6	(11.9)	25	51.7	(11.7)	26	.99	.01
● Age of mother in years at pretest	28.0	(5.8)	35	31.0	(4.9)	30	.06	.52	28.2	(5.7)	25	31.0	(4.4)	26	.06	.49
● Age of father in years at pretest	31.0	(7.0)	28	32.0	(4.8)	24	.36	.14	31.7	(7.2)	20	33.1	(6.6)	23	.51	.19
● Percent Male*	68.0		37	74		31	.56	.17	36.0		25	27.0		26	.50	-.23
● Years of Education for Mother	11.6	(2.0)	37	12.7	(1.8)	31	.02	.55	11.4	(2.0)	25	12.8	(2.0)	26	.02	.70
● Years of Education for Father	11.8	(2.4)	27	12.8	(2.5)	28	.13	.42	11.6	(2.4)	21	12.8	(2.7)	24	.10	.50
● Percent with both parents* living at home	70.0		37	68.0		31	.83	-.07	72.0		25	73.0		26	.93	.03
● Percent of children who* are caucasian	83.0		36	90.0		31	.41	.27	84.0		25	88.0		26	.65	.17
● Hours per week mother employed	5.9	(11.3)	36	5.6	(11.4)	31	.91	-.03	6.6	(12.1)	25	6.2	(12.2)	26	.91	-.03
● Hours per week father employed	32.8	(22.9)	24	34.1	(22.5)	26	.84	.06	29.2	(24.3)	19	33.0	(21.2)	23	.59	.16
● Percent of mothers* employed as technical/ managerial or above	6.0		35	3.0		31	.63	-.15	4.0		25	4.0		26	.98	-.02
● Percent of fathers* employed as technical/ managerial or above	13.0		24	38.0		26	.04	.75	10.0		20	35.0		23	.05	.74
● Total household income	$15,309	($15,916)	34	$21,016	($15,942)	31	.15	.36	$18,250	($18,510)	22	$23,365	($19,518)	26	.36	.28
● Percent with mother as* primary caregiver	94.0		35	97.0		31	.63	.15	100.0		24	96.0		26	.61	-.30
● Percent of children in daycare	37.0		35	32.0		31	.68	-.12	32.0		25	46.0		26	.31	.34
● Number of siblings	1.4	(0.8)	36	1.6	(0.8)	31	.27	.25	1.6	(0.8)	25	1.4	(0.8)	26	.18	-.25
● Percent with English* as primary language	100		36	100		31	---	.00	100		25	100		26	---	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0"

** $ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

--- indicates t-test could not be conducted because of no variance in one group

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assignment procedures, there was a slight bias in demographic characteristics favoring the Center + PIE group. Variables where such discrepancies occurred were considered as covariates in later analyses.

On measures that present demographic information on fathers, data are presented from a smaller "n" than many other variables. This can be partly attributed to data collection methods. Mothers were the primary providers of demographic and family functioning measures. In the majority of cases where "father data" was not obtained, it was not obtained from families where the father was not living at home.

Table 12.1 also presents demographic data on subjects who received Posttest #2, Posttest #3 and Posttest #4. In each case, there was some additional attrition from the study. Differences between groups noted earlier generally continued from posttest to posttest, suggesting a slight bias in favor of the Center + PIE group.

Attrition. Of 86 subjects who received some intervention, 10 dropped from the study; all were experimental subjects. For control subjects, attrition was defined as the child withdrawing from intervention after having received a minimum of three months of intervention. All experimental group attrition was related to parent inability to attend parent training meetings and their expressed desire to be removed from the study. Attrition for the PIE group was defined as the parent indicating that he/she was not interested in continued participation in the research project or withdrawal for any reason after PIE sessions had begun. This differs from the case where the parent attended PIE meetings infrequently, but did not express a desire to be removed from the study. As a result of this attrition, 76 subjects completed one year of intervention.

No attrition has occurred with those subjects enrolled in intervention for two consecutive years or from Cohort #2 subjects. Of those subjects who "graduated" into the school-age program, six were lost to attrition during Posttest #2. Five were center-only subjects, and one was a Center + PIE subject. In the Center-only group, one family chose to discontinue participation, one family had moved, one child had recently been institutionalized and permission to test was not obtained, and the parents of two children refused testing at that time. In the Center + PIE group, the parent of the child refused testing at that time.

Eight subjects were lost to attrition at Posttest #3 (total n = 68). Five of these subjects were from the Center-only group, and three were from the Center + PIE group. The reasons for not testing the Center-only subjects were the same as at Posttest #2. In the Center + PIE group, the parents of two children refused testing, and one child could not be located. Once again, none of the Cohort #2 subjects were lost to attrition.

At Posttest #4, 51 subjects have been tested. Only 5 children from Cohort #1 were unavailable for testing. All these were Center-only subjects and were the same five that had not been tested during past years. Follow-up for Posttest #4 for Cohort #2 subjects seems positive based on past experience with this cohort, but posttesting for this cohort will not occur until Summer 1991.

Attrition analysis. To examine the effect of subject attrition on the pool of subjects, attrition analyses on demographic and pretest variables were conducted on the 10 subjects who dropped during the first year of intervention. Where all attrition occurred in the Center + PIE group, the attrition analysis compared these subjects only with those that remained in the Center + PIE group. These data are presented in Tables 12.2 and 12.3.

Of the 32 variables examined for differences between those subjects who remained in the study and those who dropped out, there was a statistically significant difference on only one pretest score from the Family Support Scale (FSS). Parents who dropped from the training group reported less support as measured by the FSS. These analyses indicate that attrition was not systematic and did not bias the outcome of the research.

Table 12.2

Attrition Analysis on Demographic Characteristics of Subjects Who Remained or Dropped from the Des Moines Parent Involvement Study

	Remained[♦]			Dropped				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES[^]
• Age of child in months at pretest	52.3	(11.9)	34	48.4	(12.5)	10	.37	.32
• Age of mother in years at pretest	30.8	(4.8)	33	28.7	(5.0)	9	.24	.43
• Age of father in years at pretest	33.1	(6.1)	27	35.0	(5.9)	7	.46	-.32
• Percent Male[*]	73.5		34	80.0		10	.69	-.09
• Years of Education for Mother	12.6	(1.9)	34	12.0	(1.8)	10	.35	.32
• Years of Education for Father	12.8	(2.6)	31	12.4	(3.5)	8	.72	.14
• Percent with both parents[*] living at home	70.6		34	60.0		10	.54	.30
• Percent of children who are[*] caucasian	91.3		34	70.0		10	.21	.79
• Hours per week mother employed	5.1	(11.0)	34	6.4	(13.6)	9	.76	-.11
• Hours per week father employed	33.3	(22.3)	29	28.0	(26.8)	5	.64	.23
• Percent of mothers[*] employed as technical managerial or above	2.9		34	0.0		10	---	.21
• Percent of fathers[*] employed as technical/ managerial or above	37.9		29	33.3		6	.84	.03
• Total household income	$21,632	($18,323)	34	$27,400	($28,417)	5	.54	-.30
• Percent with mother as[*] primary caregiver	97.1		34	100.0		9	---	-.26
• Percent of children in[*] daycare	3.5		34	4.4		9	.62	-.46
• Number of siblings	1.5	(0.8)	34	1.4	(1.4)	10	.88	.10
• Percent with English as[*] as primary language	100.0		34	100.0		10	---	.00

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "0."

[^] $ES = \frac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{\text{SD (Pooled)}}$ ESs for percentage values are based on a probit transformation. The sign of the effect size only indicates direction of result, no value judgments are intended.

"---" indicates t-test could not be conducted because of no variance in one group.

[♦] All subjects who dropped were in the Center + PIE group. Therefore, only subjects who remained in the Center + PIE groups are used in these comparisons.

Table 12.3

Attrition Analysis on Pretest Measures of Subjects Who Remained or Dropped from the Des Moines Parent Involvement Study

	Remained["]			Dropped				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[^]
• Battelle Developmental[*] Inventory (BDI)								
DQs for:								
Personal/Social	67.5	(18.5)	34	61.4	(11.4)	10	.22	.45
Adaptive Behavior	63.1	(22.1)	34	66.9	(10.8)	10	.88	-.06
Motor	62.6	(22.0)	34	68.9	(16.3)	10	.89	-.05
Communication	57.5	(20.6)	34	58.0	(20.2)	10	.69	.14
Cognitive	64.0	(19.6)	34	66.0	(20.0)	10	.62	.18
TOTAL	62.6	(16.7)	34	62.9	(11.7)	10	.66	.16
• Parenting Stress Index (PSI)[♦]								
Child Related (range 30 to 250)	117.4	(18.4)	34	119.0	(15.0)	10	.80	.09
Other Related (range 54 to 270)	131.6	(28.8)	34	122.1	(19.2)	10	.34	-.35
TOTAL (range 101 to 505)	248.9	(43.3)	34	241.1	(29.5)	10	.60	-.19
• Family Adaptation and[♣] Cohesion Evaluation Scales (FACES)								
Adaptation (range 0 to 30)	3.6	(2.3)	34	4.2	(3.1)	10	.49	.24
Cohesion (range 0 to 26)	4.0	(3.5)	34	3.2	(1.9)	10	.39	-.25
TOTAL (range 1 to 40)	5.9	(3.3)	34	5.8	(2.9)	10	.90	-.03
• Family Resource Scale[▲] (FRS) (range 30 to 150)	116.3	(19.5)	34	117.2	(19.0)	10	.89	-.05
• Family Inventory of Life[♦] Events (FILE) (range 0 to 71)	12.0	(8.0)	34	9.1	(7.4)	10	.32	-.37
• Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	2.2	(0.8)	33	1.7	(0.4)	10	.02	.68

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[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales. For ease in interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing. ES and p value are based on raw scores.

[♣] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[▲] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[^] $ES = \dfrac{\bar{x}\text{ (Remained)} - \bar{x}\text{ (Dropped)}}{SD\text{ (Pooled)}}$ The sign of the ES is reversed for the PSI, FILE, and FACES, as lower scores are preferred.

["] All subjects who dropped were in the Center + PIE group. Therefore, only subjects who were in the Center + PIE group are used in these comparisons.

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Intervention Programs

The Des Moines Public School System provided educational services to preschool-aged children, ages 3 through 6, who exhibited developmental delays or who had disabilities. These children received center-based (classroom), half-day, 5-day-per-week intervention services. Children received services in educational formats (i.e., large group, small group, and one-to-one) according to their individual needs from special education teachers and teacher associates (paraprofessionals). Language and motor therapists assessed children, provided teachers with objectives, helped teachers integrate instructional therapeutic activities into on-going routines, and provided individualized services as needed. Teachers were free to use various curricula or to develop their own objectives when developing intervention goals and strategies.

The Des Moines Public School Early Intervention Program provided services to a wide variety of children with disabilities, from those exhibiting mild delays to those exhibiting more severe disabilities. The majority of children served were Caucasian, and a wide variety of SES levels were represented. As part of these services to children, parents were regularly involved in IEP meetings; teachers attempted to include and keep parents informed of classroom activities as child and parent needs dictated. In practice, this resulted in regular contacts with parents regarding child progress and participation at IEP meetings, but nothing else.

The purpose of the research study occurring with the Des Moines Public School Early Intervention Program was to compare the effects of their current service delivery system with the same system enhanced by the inclusion of one type of systematic parent involvement. In both the control and experimental conditions, children received services in the center-based Des Moines Public School Early Intervention Preschool Program. No changes were made to this system for the purposes of the study. Children in the center and parent involvement (center + PIE) intervention were not segregated by classroom or teacher in the center-based service. In the experimental group, parents of children enrolled in the early intervention program were exposed to a systematic parent curriculum. In their first year of involvement, parents were involved in the Parents Involved in Education (PIE I) package (Pezzino & Lauritzen, 1986). Parents whose children remained in the program for a second year and were in the experimental group were involved in the Parents Involved in Education II (PIE II) package (Durbala & Hollinger, 1988). Data on group assignment were presented earlier in Figure 12.1.

Center-only intervention. Children assigned to this group attended an existing center-based, half-day, 5-day-per-week intervention program in which they received small group and individualized teaching sessions from special education teachers and paraprofessional aides. All teachers were certified and were responsible for supervision of their respective aides. None of the aides were certified as teachers. The training for aides consisted mostly of periodic inservices provided by the school district that both teacher, aides, and support staff attend, and on-the-job training provided by their respective teachers and the collaborating speech and motor therapists. Each class of approximately 10 children had one special education teacher and one aide. Because each child's program was "IEP driven," motor and speech therapists' contact with children varied widely. In general, a motor and speech therapist was present in each class for the equivalent of 1-day-per-week. During a typical day, children were instructed in the motor, speech and language, self-help, cognitive, and social skills areas. As part of the regular services to children, parents were involved in IEP meetings, and teachers provided parents with IEP updates.

The CAPER, along with other curriculum-linked assessment tools, were used in determining intervention goals and strategies. Intervention activities were developed from comprehensive assessments and items drawn from a number of curricula.

Teachers were free to select curriculum based on child need. The skill sequences in the curricula used extended beyond the child's current level of functioning, and functional skill training routines were included in the curricula to the degree appropriate.

Center + PIE intervention. In addition to the center-based service described above, parents of children in this group were offered parent meetings structured by the PIE curricula. PIE I training modules were taught by the preschool program support staff and were designed to provide parents with a systematic, conceptual, and hands-on experience in areas such as child development, observation and recording, targeting intervention behaviors, teaching processes, decision making, and communicating with professionals. The training format consisted of small-group lecture, discussion, and demonstrations. The average small group size was between 8 and 12 parents. PIE sessions consisted of 16, 2-hour meetings presented roughly once per week. PIE sessions also included a social support component in which parents had the opportunity to share feelings and express problems, challenges, and other issues associated with their lives. Parents were primarily responsible for determining the agenda for the social support component of the session. This occupied the last 15 minutes of the session and focused on issues such as problems with relatives, finding day care, etc. In addition to these sessions, parents were asked to practice the training activities at home with their children. They were asked to choose a target behavior for the child (such as a self-help or behavioral skill; e.g., compliance, dressing, etc.), implement an intervention program, and measure progress by comparing successful completion of the task before and after the intervention.

Parents whose children remained in the preschool program for a second year continued in a systematic, parent intervention, but through a different intervention package. The children continued in appropriate center-based services. Parents attended meetings structured by the _Parents Involved in Education II_ (PIE II) curriculum (Durbala & Hollinger, 1988). The PIE II was developed based on a parent needs assessment and focused on parent support issues. Issues addressed included: dealing with parent stress, developing parent communication skills, teaching problem-solving skills, and providing information on areas of interest. The training format for PIE II was the same as PIE I, except 12 sessions were held. Parent home activities that were presented focused on support (e.g., practice parent-focused stress reduction technique, dealing with emotional issues of siblings) rather than child training issues. As in PIE I, a social support component was available at the end of each session.

PIE I and PIE II were conducted by preschool program support staff (e.g., school psychologist, speech and language therapists, consultant, nurse). Classroom teachers and aides were not involved in the PIE meetings and were only indirectly aware of the goals of PIE. Each PIE group was facilitated by a team of two staff members. All parent facilitators received instruction in PIE I and PIE II by their respective developers prior to its initial implementation. Meetings were primarily attended by the children's mothers. Table 12.4 lists session topics for PIE I and PIE II.

The intent of the PIE I sessions was primarily to give parents knowledge of and to teach skills that would enable them to serve as interventionists in the home setting. PIE I was based on the philosophy that child progress can be maximized by training parents as interventionists and that the skills parents learn (i.e., their success as an interventionist) will allow the family to more competently function (i.e., by reducing parent stress and uncertainty). In contrast, although the primary intent of PIE II was also to provide knowledge, the knowledge dealt more with information on the effect of a child with a disability on the family, and strategies to normalize the functioning of the family. The philosophy behind this approach ties into the ecological model of development (Bronfenbrenner, 1979), in that positive changes in the family are expected to have positive effects on each individual family

Table 12.4

Content of PIE I and PIE II

Session	Topic
PIE I	
1.	Introduction and overview
2.	Objective observation of child behavior
3.	Defining and measuring behavior
4.	Principles of behavior management
5.	Analyzing behavior chains
6.	Theories of child development
7.	Testing and assessment
8.	Criterion-referenced assessment
9.	Developing learning objectives
10.	P.L. 99-142 and IEPs
11.	Intervention strategies
12.	Factors related to teaching success
13.	Practice teaching session
14.	Determining appropriate interventions
15.	Communicating with professionals
16.	Review, comments, concerns, questions
PIE II	
1.	Parent needs assessment and introduction
2.	Child development and behavior management
3.	Stress reduction
4.	Strategies for improving social and language skills
5.	Strategies for improving self-help and cognitive skills
6.	Communication
7.	The grief process
8.	Community services
9.	Feelings of siblings and extended family members
10.	Understanding my child's rights: Dialogues with professionals
11.	Promoting family fun
12.	Review, questions, and evaluation

member. In addition to the PIE, parents in the Center + PIE group were provided the opportunity to attend four sessions conducted by the school nurse. These sessions focused on involvement of both spouses, where possible, and on facilitating communication between families. These sessions were informal in nature and focused on a topic such as a discussion on child nutrition, and on activities (e.g., a family swim night, making gifts at Christmas time).

Treatment Verification

A number of procedures were implemented to provide an independent verification of specifics of the intervention program. Failure to obtain these data can potentially result in an erroneous conclusion (Barnett et al., 1987; Cooke & Poole, 1980). Sources of treatment verification will be described below.

One year of intervention. Treatment verification data are presented in Table 12.5 for subjects receiving one year of intervention. Child attendance data for basic services and parent attendance data for parents' training sessions were recorded throughout the year. Child attendance was recorded daily, and parent attendance data (for the Center + PIE group) was recorded weekly; these data were sent to EIRI on a monthly basis. An initial analysis of attendance data indicates no difference in child attendance rates as a function of group placement (Table 12.5). Average attendance for all subjects was 88.2% of possible school days. Average attendance by parents at the training sessions was 47.6% of all PIE classes for all parents. Fifty-seven percent of parents attended between 5 and 11 classes; only 13% of parents (5 parents) attended more than 75% of the time. These absences occurred in spite of repeated attempts by program staff to encourage regular attendance. The local site coordinator regularly called absent parents to promote attendance. These data pertain only to PIE I and will need to be considered when conducting data analysis and discussing results.

A description of quality of parent involvement was also gathered annually by a direct intervenor (teacher) who worked most closely with the respective parent. The data obtained was the intervenor's perception (low, average, high) of how a parent rated on attendance, knowledge, and support. These data are presented in Table 12.5. Teachers rated parents in the Center + PIE group as having a higher

Table 12.5

Treatment Verification Data for Subjects Receiving One Year of Intervention for Des Moines Study

	Center-Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES[♦]
• General health of child[&]	2.0	(0.5)	39	1.9	(0.7)	32	.66	-.20
• Percent child attendance	87.3	(7.9)	38	90.0	(6.6)	34	.13	.34
• Parent satisfaction	24.9	(2.5)	29	25.1	(2.9)	26	.73	.08
• Teacher rating of parents[*]	5.3	(2.0)	40	7.0	(1.9)	34	.00	.85
• Parent PIE attendance	---	---	---	47.6	(22.0)	34	---	---
• Additional Services received[·] outside the intervention program								
Percent receiving outside[**] speech therapy	7.3		41	9.1		33	.79	.12
Percent receiving outside[**] motor therapy	7.3		41	6.1		33	.83	-.05

[&] Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28). Higher scores indicate greater satisfaction.

[*] Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

[·] Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

[♦] $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{\text{SD (Center Only)}}$$

[**] Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

quality involvement with the school program. This occurred although teachers were not directly informed of child group placement (although information could have been shared by parent and teacher or indicated through other cues).

In addition to the intervenor's rating of parents, parents were asked to rate their satisfaction with the program (see Table 12.5). Parents rated the intervention program on seven questions that assess satisfaction in a variety of areas (e.g., staff, participation, communication, etc.). Parents in both groups were equally satisfied with the center-based program. Satisfaction data were not obtained from parents who began intervention in 1987-88 (20 parents).

Health data on each child were also obtained as an additional verification measure. Data on hospitalizations (and length), days with fever, and general health rating of the child, and other factors were collected. Data on child general health are presented in Table 12.5. No differences between the study groups were found on any of the health measures.

Teachers in Des Moines were also evaluated annually by their immediate supervisor. These data are relevant to treatment verification. Teachers were rated by their supervisor either as being satisfactory or as needing training. The Des Moines School District uses only two rating levels as per an agreement with the local teachers' union, and no other evaluations can be conducted as per the contract. All teachers of subjects involved in this study received a satisfactory rating.

Additionally, information was obtained at posttest on the amount of time each child spends in various activities/therapies such as daycare, speech therapy, etc. outside of the intervention program. The data for the two most frequently occurring additional services are presented in Table 12.5. No group differences were found.

Two years of intervention. Treatment verification data for subjects receiving two years of intervention are presented in Table 12.6. These data are presented by first and second year of intervention. Variables on which these data were obtained were discussed previously and will not be repeated. The groups were not significantly different on any of the treatment verification variables in either year.

Parent satisfaction data obtained after the second year of intervention were different than those obtained earlier. Satisfaction questions focused on the parents involvement in, and understanding of, the child's educational program. This was done in an attempt to make the satisfaction questionnaire more sensitive to aspects of parent involvement. The data presented in Table 12.6 indicate no group differences using this new questionnaire.

Table 12.6

Treatment Verification Data on Subjects Receiving Two Years of Intervention Presented by First and Second Year of Intervention for the Des Moines Parent Involvement Study

	First Year								Second Year							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES♦
● General health of child^	1.9	0.5	15	1.8	0.8	18	.89	-.20	1.9	0.7	14	1.8	0.6	18	.69	-.14
● Percent child attendance	88.3	7.3	12	89.0	6.1	19	.77	.10	88.4	5.6	14	88.9	11.3	18	.89	.09
● Parent satisfaction'	25.0	2.2	14	24.9	3.1	19	.91	-.05	26.7	3.0	7	26.3	5.5	15	.84	-.13
● Teacher rating of parents#	6.4	1.9	14	7.2	1.9	19	.25	.42	7.1	1.7	14	8.0	1.4	16	.11	.53
● Additional services received* outside the intervention program																
Percent receiving* outside speech therapy	0.0		15	5.2		19	---	.13	0.0		12	17.8		17	.28	.38
Percent receiving* outside PT/OT therapy	6.7		15	0.0		19	---	-.25	0.0		12	0.0		17	---	.00

^ Based on a parent rating of the child's health where 1 = worse than peers, 2 = same as peers, 3 = better than peers.

' Satisfaction is based on the sum of seven questions that deal with various aspects of satisfaction with the center-based program (range = 7 - 28) in the first year. In the second year, satisfaction is based on the sum of eight questions that deal with aspects of satisfaction related to the parents participation in the child's educational program (range = 8 to 32). Higher scores indicate greater satisfaction.

Teacher rating is based on the sum of three questions assessing parent support, knowledge, and attendance at school activities (range = 3 - 9). Higher scores indicate a better rating.

"---" = t-test not conducted because of no variance in one group.

♦ $ES = \dfrac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center Only)}}{SD\text{ (Center Only)}}$

** Statistical analyses for these variables were based on a t-test where those receiving services were scored "1" and those not receiving services "0." Effect sizes are based on a probit transformation of percentage data.

Average attendance at parent training sessions during the first year of intervention ranged from 2 to 13 of 16 possible PIE I sessions, with a mean of 7.8 sessions (SD = 3.0). During the second year, of 12 PIE II sessions, parents attended from 0 to 12 sessions with a mean of 4.6 sessions (SD = 4.4). Regular parent contacts were made to nonattending parents in an attempt to increase attendance.

The concern that the Center + PIE I + PIE II subgroup of the Center + PIE group might have been different from the other parents in the Center + PIE group that received only PIE I was a concern that arose in relation to attendance at parent meetings during the first year. A t-test between these two subgroups was completed on attendance at PIE I meetings, and no difference in attendance was found ($\underline{t}$ = 1.08, $\underline{p}$ = .29).

Site review. A final source of treatment verification information was a site review conducted annually by the site coordinator. The first site review was conducted on April 10, 1987, and a second site review was conducted on May 10 and 11, 1988. The purposes of these reviews were to: (a) collect information about the nature and quality of early intervention services that were being delivered, (b) verify that the research being conducted by EIRI was being implemented as intended, and (c) collect assessment data that may have been useful to site administrators to guide internal changes and for use when seeking technical assistance.

Purposes (a) and (b) are of primary interest in this report. The Des Moines School District was conducting the research as intended by EIRI. Overall findings indicated that: the preschool program was of high quality; it was staffed by enthusiastic and qualified professionals; classroom environments were safe and appropriate; teachers emphasized functional skills in naturally occurring environments; the program was competently administered, utilized up-to-date curricula, and had proper evaluation, assessment, and progress procedures; parent training sessions were well organized and well facilitated; and parent participation was good. (For more information, a copy of the site reviews can be obtained.)

Posttests #2, #3, and #4. Treatment verification data for subjects after intervention had ended was less extensive than during intervention. Treatment verification at these posttests consisted of information regarding the child's health and information regarding services the child received outside of those provided by school placement. (Hours of outside services data were not available for Posttest #4.) These data were obtained from parent report at posttest. These data are presented in Table 12.7.

No differences were found between groups in the health of the subjects for any of the posttests on any of the health variables examined. In terms of extra therapies received by subjects, a difference occurs in the amount of speech therapy subjects received outside of school. Subjects in the Center + PIE group received

Table 12.7

Treatment Verification Data for Posttest #2, #3, and #4 for Des Moines Parent Involvement Study

	POSTTEST #2								POSTTEST #3								POSTTEST #4							
	Center Only			Center + PIE					Center Only			Center + PIE					Center Only			Center + PIE				
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES♣	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES♣	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	P Value	ES♣
● General Health of Child♦	1.9	(0.6)	26	1.9	(0.5)	26	.66	.00	2.1	(0.5)	36	2.0	(0.7)	31	.45	-.20	2.2	(0.6)	23	2.2	(0.6)	24	.78	.00
● Therapies received* outside school program																								
Percent receiving** outside speech therapy	8.8		34	22.6		31	.13	.52	0		25	17.0		23	---'	.95	______			______			___	___
Percent receiving** outside PT/OT therapy	2.9		34	3.2		31	.95	.04	0		25	8.7		23	---'	.61	______			______			___	___

♦ Based on a parent rating of the child's health were 1 = worse than peers, 2 = same as peers, 3 = better than peers.

* Data are based on parent report, obtained at posttest, of time child received the service outside of school during the past year.

"______" = no data available.

♣ $ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$

' "---" indicates t-test not completed because of no variance in one group.

** Statistical analyses are based on t-tests where those receiving services were scored "1" and those not receiving services "0." ESs are based on a probit transformation of percentage data.

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more speech therapy as reported at Posttest #2 and #3. No differences between groups were found in motor therapies received at any posttest. These data suggest that Center + PIE subjects may have had a slight advantage over the Center-only subjects in communication skills because of extra speech therapy.

Test of parent knowledge. Another aspect of treatment verification was a test of parent knowledge administered to parents at all posttests. The test of parent knowledge was designed as part of PIE I and assessed the degree to which parents learned the concepts taught in PIE I. The test consisted of 30 multiple choice questions and higher scores indicated greater retention of concepts.

Initial analyses (t-tests) of data from the test of parent knowledge indicated that parents in the Center + PIE group obtained significantly higher scores than the Center-only group at all posttests. The test of parent knowledge results were reanalyzed to examine differences between parents who received intervention for one year (Center + PIE) vs two years (Center + PIE I + PIE II). Oneway analyses of variance were conducted between these two experimental subgroups and the control group. These data are presented in Table 12.8. Statistically significant differences were found at all posttests. A Scheffe procedure was conducted to determine specific group difference. The Center + PIE I + PIE II cohort performed

Table 12.8

Test of Parent Knowledge* Scores for Des Moines Parent Involvement Study

	Center Only			Center + PIE I			Center + PIE I + PIE II				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	Direction	P Value
Posttest #1	8.6	(4.2)	41	13.9	(5.9)	15	17.2	(5.4)	19	0 < 1 0 < 2	.000
Posttest #2	10.1	(6.0)	35	12.7	(5.6)	14	17.3	(7.1)	18	0 < 2	.000
Posttest #3	9.1	(5.3)	37	14.2	(5.8)	13	17.9	(7.2)	18	0 < 1 0 < 2	.000
Posttest #4	10.3	(5.6)	24	10.2	(5.0)	6	17.3	(7.7)	18	0 < 2	.003

* Range = 0 to 30

* Indicates direction of significance based on Scheffe procedure; 0 = Center-Only, 1 = Center + PIE, 2 = Center + PIE I + PIE II.

better than the control group at all posttests. The Center + PIE cohort performed better than the control group at Posttests #1 and #3. No differences were found between the experimental cohorts at any posttest, although a trend toward higher scores is evident in the Center + PIE I + PIE II cohort at all posttests.

Cost of Alternative Interventions

The cost of the basic center-based program and the center-based + PIE I and PIE II programs, as described above, was determined using the ingredients approach (Levin, 1983). Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, and contributed resources. The cost of the center-based plus PIE I and center-based plus PIE II is simply equal to the cost of the basic center-based program available to 210 children plus the additional cost of PIE I (provided to 8 families) or PIE II (provided to 19 families) in 1987-88. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. Table 12.9 presents the cost per child in each of these resource categories. At the bottom of Table 12.9, costs are discounted at real rates of 3% and 5%. All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Because the program is operated within a public school system, school and general direct administration were included. Occupancy charges included the annual rent for the facility in which the program was housed, all utilities, insurance, and maintenance

Table 12.10

Cost Per Child for Des Moines Study

Resource	Center-Based Only	Center-Based + P.I.E. PIE I	PIE II	Average PIE
1. **UNDISCOUNTED**				
Agency Resources:				
Direct Service Personnel	$4,214	$5,749	$4,645	$5,197
Administrative Personnel				
Preschool	247	247	247	247
District	1,284	1,284	1,284	1,284
Facilities	224	224	224	224
Equipment	33	33	33	33
Materials/Supplies	40	85	54	70
Transportation				
Child	501	501	501	501
Staff	36	36	36	36
Subtotal	$6,579	$8,160	$7,024	$7,592
Contributed Resources:				
Parent Transportation	0	91	54	72
Parent Time	0	772	698	734
Total	***$6,579***	***$9,023***	***$7,776***	***$8,398***
2. **DISCOUNTED COSTS (3%)**				
Agency Resources	$7,189	$8,917	$7,675	$8,296
Total Resources	7,189	9,860	8,497	9,177
3. **DISCOUNTED COSTS (5%)**				
Agency Resources	$7,616	$ 9,446	$8,131	$8,789
Total Resources	7,616	10,445	9,002	9,722

costs. Equipment costs were based on estimates of the market replacement value of all classroom and office equipment, annualized to account for interest and depreciation. Staff transportation costs for job-related travel were based on actual mileage at $.21 per mile. The average cost per child for children in special education in the school district was used for child transportation costs. The cost for materials and supplies included the annual expense to the program for all consumable items.

Contributed resources included the value of parent time working at home with their children, attending training sessions, and the time and expense of driving to the sessions. Parents in the PIE I group spent an average of 16.5 hours and PIE II parents spent an average of 9.32 hours in training sessions, and, assuming that parents followed PIE curriculum requirements, 60 hours working at home with their child. In addition, parents in both groups were interviewed via telephone to determine their transportation expenses to attend sessions. These costs were assigned the opportunity cost of $9 per hour; mileage was assessed at $.21 per mile.

Data Collection

It is important to note that the data collected for this study were collected to assess the effects of intervention not only on the children, but also on their families. As noted earlier, pretest data and data from Posttest #s 1, 2, 3, and 4 have been collected. The instruments used to obtain data on children and their families and the posttest administration information on these instruments is presented in Table 12.10. A brief description of each of these instruments is presented in Table 12.11.

Recruitment, training, and monitoring of diagnosticians. The Battelle examiners were doctoral candidates in the School Psychology program at Iowa State University and other professionals in the community (i.e., speech and language therapists). Their training included an extensive inservice on BDI administration and scoring; and each examiner, after administering a minimum of three practice BDIs, was required to pass a quality-control test administration before they were permitted to test. Further, each examiner was "shadow scored" at least once during each testing period. Interrater reliability data on the BDI reveal coefficients consistently above .90.

Table 12.10

Schedule of Administration and Tests Administered for Des Moines Parent Involvement Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X	X	
Woodcock-Johnson Tests of Achievement					X
Scales of Independent Behavior					X
Joseph Preschool and Primary Self-Concept Inventory[*]		X	X	X	X
Stanford-Binet Intelligence Test, Form L-M[**]		X			
Developmental SPECS					X
FAMILY MEASURES					
Parent Stress Index	X	X	X	X	X
Family Support Scale[-]	X	X	X		X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes[-]	X	X	X		
Family Adaptation and Cohesion Evaluation Scales	X	X	X	X	X
CES-D Depression Scale		X	X	X	
Child Improvement Questionnaire		X	X	X	X
Parent as a Teacher Scale[*]		X	X	X	X

[*] At Posttest #1, this test was administered to Cohort 2 subjects. This test was not included in the test battery until 1988.

[**] This test was administered at Posttest #1 to Cohort 1 subjects only. The costs for administering this test were very high and the information being generated did not substantially add to that which was being otherwise collected.

[-] At Posttest #2, these were completed only for Cohort 1 subjects due to an error caused by the staggered testing of cohorts.

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Table 12.11

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses personal/social, adaptive, motor, communication, and cognitive skills, and provides a total score.
Woodcock-Johnson Tests of Achievement (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: motor skills, social and communication skills, personal living skills, and community living skills.
Joseph Preschool and Primary Self-Concept Screening Test (JSI) (Joseph, 1979)	Assesses the self-concept of children ages 3.6 to 9.11 years via responses to line drawings. It provides a global self-concept score.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: communication, sensorimotor, physical, self-regulation, cognition, and self-social.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors .
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: intra-family, martial, pregnancy and childbearing, finance and business, work-family transitions, illness and family "care," losses, transitions "in and out," and legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.

(continued)

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Table 12.11 (continued)

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Child Improvement Questionnaire (Devellis, et al., 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Parent as a Teacher Scale (PAAT) (Strom, 1984)	Assesses parent attitudes toward aspects of the parent-child interactive system. The PAAT responses are grouped into five areas: creativity, frustration, control, play, and teaching-learning.

All test protocols were also rescored by EIRI clerical staff and errors indicated. This rescoring has resulted in only minor errors being discovered, increasing confidence in the examiners. These examiners also administered the Peabody Picture Vocabulary Test (PPVT) to mothers. This was done concurrent with the posttest BDI administration. None of the examiners had any involvement with the Des Moines School District program, so the likelihood of their knowing to which group a child was assigned was remote.

All Stanford-Binets were administered by three trained doctoral candidates in the Psychology program at Utah State University. All Stanford-Binet examiners were uninformed about the subjects' group assignments. None of the Stanford-Binet examiners had any other involvement with EIRI or the Des Moines Public Schools, so the likelihood of their knowing group assignments was also remote. The Stanford-Binet was administered while the child was in his preschool classroom placement.

During the Spring 1988 posttesting, the Joseph Preschool and Primary Self-Concept Inventory (JSI) was added as a measure. BDI examiners were trained in the administration of the JSI. Two examiners administered all JSIs (in 1988) to children while they were in the classroom placement. In following years, the JSI was administered with the other family measures.

For Posttest #4, two BDI examiners were trained in the use of the Woodcock-Johnson Tests of Achievement and the Scales of Independent Behavior. Certification requirements for administering these tests was the same as those established for the BDI. The mean interrater reliability on these instruments for Posttest #4 was 97.8%.

Administration of family measures has varied. At pretest, Posttest #1, and for some subjects at Posttest #2 (see second posttesting below), the measures were administered to parents while in a group by the site liaison. Parents were not allowed to discuss these measures during the session (except for individual questions to the liaison) and parents were requested not to discuss this information with other parents. This method of administration was selected to help ensure that examiners remained "blind" to subject group placement.

For some subjects in Posttest #2, and for subsequent posttests, parents completed posttest information during and following the time child measures were being administered. Examiners were familiarized with procedures to be followed for the family measures and with the measures.

Pretest. The following procedures were completed at pretest. Parents of each child participating in the study completed an informed consent form and provided demographic information. In the first of two pretesting sessions, parents (usually the mother) completed the family measures. In a second pretesting session, which took place within 2 weeks of the first session, children were administered the Battelle Developmental Inventory (BDI). Parents were paid $20 after both pretesting sessions were completed.

First posttesting. At the first posttest, a similar course of events occurred. Family measures were administered in one session and child measures during another session (see Table 12.10). At this and all subsequent posttests, demographic information was updated and parents provided information relevant to treatment verification. At this posttest only, mothers were administered the Peabody Picture Vocabulary Test--Revised (Dunn & Dunn, 1981). Parents were paid for participating in posttest activities. Payment was provided at all subsequent posttests.

Second posttesting. At Posttest #2, events differed slightly depending on whether children were enrolled in the preschool intervention program or school-age program. Children in the preschool intervention program were posttested in the same manner as Posttest #1. Parents and children in the school-age program were tested during a single session. This change from two to one session for posttest activities was the only different aspect of the process.

Third posttesting. At Posttest #3, all measures were administered using the single session format.

Fourth posttesting. The format for Posttest #4 activities was the same as that described for Posttest #3. At Posttest #4, the BDI was no longer used. The mean age for subjects at this posttest was 94 months. The BDI is inappropriate for many children at this age level. A number of ceiling problems had been noted on the BDI at Posttest #3. Child measures were changed at this point for all subjects (see Tables 12.10 and 12.11). In addition, information was obtained from each child's teacher on classroom placement and the teacher's judgment of child skills (SPECS). Parent permission to contact teachers was obtained. Teachers were mailed forms to be completed with appropriate descriptive information. Teachers were remunerated for their participation.

Cross posttesting issues. Two assessment issues cut across Posttest #3 and #4. These cross issues are the result of the staggered initial start dates for students. The teacher data (described above) have been collected for Cohort #2 subjects at Posttest #3 as well as for Cohort #1 subjects at Posttest #4. These data have been analyzed across posttests. Teacher follow-up forms were sent to 55 teachers, accounting for 71 children. Forty-five teachers have returned information (81%). This represents information on 58 subjects. Activities to collect these data from nonparticipating teachers remains active. These teacher follow-up data consist of a teacher-completed SPECS on each child and a classroom placement form.

A second issue that crosses posttests is data related to parent-child interaction. These data were collected to address concerns regarding qualitative aspects of the parent-child system that may have changed. These data were collected on all children during posttesting in Spring 1990. These data have been analyzed across posttests. A videotape protocol was developed to record parent-child interactions. Examiners were trained in this protocol and recorded interactions as the final part of the posttesting session.

Results and Discussion

This section will present data from all posttests.

Comparability of Groups on Pretest Measures

Comparability of groups at pretest for each of the posttest sessions will be presented in this section. Analyses are reported separately for each posttest because of the change in number of subjects at each posttest time.

Based on available demographic data (presented earlier in Table 12.1), there was a slight advantage for those subjects whose parents were involved in the Center + PIE group. The Center + PIE group families were better educated, held higher SES occupations, and had a higher annual income.

Additional information on the comparability of groups is presented in Table 12.12. This table presents data from the core measures at pretest for the Center-Only and Center + PIE groups. On the BDI, there is a slight advantage in favor of the Center + PIE group subjects in the adaptive and motor domain areas ($p < .10$).

On three of the family measures, significant differences were found between the groups. Based on the FACES, families of the Center-Only group subjects were functioning further from the "ideal" than families in the Center + PIE group. This occurred on their total FACES score as well as on the adaptation scale. The results of the FILE indicate that the families of subjects in the Center + PIE group had more major life events occur in the past year than families in the control group. In contrast, scores from the Family Support Scale indicate that families in the Center + PIE group had more sources of support.

Although the families differed on these three measures, their stress ratings (based on the PSI) were not different. Also, resources available to each family (FRS) by group were comparable. Current knowledge of family functioning makes it difficult to interpret the effect these different patterns may have on subject or family functioning as a result of intervention.

Also include on Table 12.12 are scores from mother's performance on the Peabody Picture Vocabulary Test. This result is not an outcome variable, even though obtained at posttest. These data are related to the comparability of groups. A significant difference was found between mother's standard scores on this test, with mothers in the Center + PIE group demonstrating higher scores. Standard scores on this test are highly correlated with IQ scores. Mother's IQ has been hypothesized to be related to intervention success.

Overall, these results suggest that any group advantages at pretest favored the Center + PIE group. These advantages occur in regard to demographic factors, to children's skill levels, and to overall family functioning.

The pattern of results found for comparability of groups at Posttest #1 is essentially the same for Posttest #'s 2, 3, and 4 (see Tables 12.1 and 12.12). Although there are minor changes from one to another, the general pattern is one of comparability between the groups with what few differences do exist being in favor of the Center + PIE group.

Effects of Alternative Forms of Intervention

The following section will analyze the effects of the alternative forms of intervention on child and family functioning, and examine some site specific analyses.

Table 12.12

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	POSTTEST #1								*POSTTEST #2*							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
● Battelle Developmental* Inventory (BDI)																
Personal/Social	69.1	(21.2)	42	67.5	(18.5)	34	.73	-.08	71.0	(22.0)	37	68.0	(19.0)	33	.70	-.08
Adaptive Behavior	70.5	(17.0)	42	63.0	(22.1)	34	.06	-.44	71.0	(18.0)	37	64.0	(22.0)	33	.15	-.36
Motor	71.4	(18.6)	42	62.6	(22.0)	34	.08	-.47	71.0	(20.0)	37	63.0	(22.0)	33	.20	-.34
Communication	60.2	(16.3)	42	57.5	(20.6)	34	.52	-.17	60.0	(16.0)	37	58.0	(21.0)	33	.72	-.10
Cognitive	65.0	(17.2)	42	68.9	(19.6)	34	.94	.23	65.0	(18.0)	37	64.0	(20.0)	33	.95	.02
TOTAL	66.3	(14.0)	42	62.6	(16.7)	34	.29	-.26	67.0	(15.0)	37	63.0	(17.0)	33	.43	-.20
● Parenting Stress Index (PSI)♦																
Child Related (range 0 to 30)	118.9	(20.4)	41	117.4	(18.4)	34	.73	.07	118.8	(20.0)	36	117.9	(18.4)	33	.85	.05
Other Related (range 54 to 270)	131.3	(23.7)	41	131.6	(28.8)	34	.97	-.01	130.2	(22.1)	36	132.8	(28.3)	33	.68	-.12
TOTAL (range 101 to 505)	250.2	(40.1)	41	248.9	(43.3)	34	.89	.03	249.0	(37.5)	36	250.7	(42.7)	33	.86	-.05
● Family Adaptation and♣ Cohesion Evaluation Scales (FACES)																
Adaptation (range 0 to 30)	6.2	(3.5)	41	3.6	(2.3)	34	.00	.74	6.3	(3.6)	36	3.5	(2.3)	33	.00	.78
Cohesion (range 0 to 26)	5.4	(5.0)	41	4.0	(3.5)	34	.14	.28	5.6	(5.0)	36	4.0	(3.5)	33	.13	.32
TOTAL (range 1 to 40)	8.9	(5.1)	41	5.9	(3.3)	34	.00	.59	9.1	(5.0)	36	5.9	(3.4)	33	.00	.64
● Family Resource Scale♠ (FRS) (range 30 to 150)	118.8	(14.8)	41	116.3	(19.5)	34	.52	-.17	119.7	(14.5)	36	116.3	(19.8)	33	.42	-.23
● Family Inventory of Life♦ Events (FILE) (range 0 to 71)	8.1	(4.8)	41	12.0	(8.0)	34	.02	-.81	7.8	(4.8)	36	11.9	(8.1)	33	.01	-.85
● Family Support Scale (FSS)δ Total Score (range 0 to 4)	1.8	(0.7)	40	2.2	(0.8)	33	.06	.57	1.9	(0.7)	35	2.2	(0.8)	32	.19	.43
● Peabody Picture Vocabulary& Test - Revised (PPVT)	83.3	(18.1)	40	92.3	(18.3)	34	.04	.50	83.2	(19.1)	35	93.6	(16.9)	33	.02	.54

(continued)

* Statistical analyses for BDI scores were conducted using raw scores for each of the scales; p value and ESs are based on these raw score analyses. For ease in interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

♣ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

♠ Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

♦ Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

δ Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

& Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

$$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$$

The sign of the ES is reversed for the PSI, FILE, and FACES, as lower scores are preferred.

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Table 12.12 (continued)

Comparability of Groups on Pretest Measures for Des Moines Parent Involvement Study

	POSTTEST #3								POSTTEST #4							
	Center-Only			Center + PIE					Center-Only			Center + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
● Battelle Developmental Inventory (BDI)[*]																
Personal/Social	70.0	(22.0)	37	68.0	(19.0)	31	.77	-.07	69.0	(17.0)	25	68.0	(19.0)	26	.85	-.05
Adaptive Behavior	71.0	(18.0)	37	64.0	(22.0)	31	.14	-.37	71.0	(19.0)	25	60.0	(20.0)	26	.07	-.53
Motor	71.0	(20.0)	37	63.0	(23.0)	31	.16	-.38	73.0	(20.0)	25	62.0	(20.0)	26	.14	-.47
Communication	60.0	(17.0)	37	59.0	(21.0)	31	.76	-.08	59.0	(17.0)	25	55.0	(20.0)	26	.52	-.20
Cognitive	65.0	(18.0)	37	65.0	(20.0)	31	.84	.05	64.0	(20.0)	25	61.0	(20.0)	26	.89	-.04
TOTAL	66.0	(15.0)	37	63.0	(17.0)	31	.45	-.19	66.0	(15.0)	25	62.0	(17.0)	26	.36	-.28
● Parenting Stress Index (PSI)[♦]																
Child Related (range 0 to 30)	118.2	(20.7)	36	118.1	(18.7)	31	.98	.00	116.7	(20.3)	25	117.3	(15.4)	26	.91	-.03
Other Related (range 54 to 270)	129.6	(23.0)	36	134.4	(28.0)	31	.44	-.21	128.7	(23.2)	25	131.0	(29.3)	26	.76	-.10
TOTAL (range 101 to 505)	247.8	(39.2)	36	252.5	(42.5)	31	.64	-.12	245.4	(37.6)	25	248.3	(42.3)	26	.80	-.08
● Family Adaptation and Cohesion Evaluation Scales (FACES)[△]																
Adaptation (range 0 to 30)	6.4	(3.4)	36	3.6	(2.4)	31	.00	.82	7.3	(3.4)	25	3.7	(2.2)	26	.00	1.06
Cohesion (range 0 to 26)	5.7	(5.1)	36	4.1	(3.6)	31	.13	.31	5.8	(5.0)	25	4.1	(3.5)	26	.16	.34
TOTAL (range 1 to 40)	9.3	(4.9)	36	5.9	(3.5)	31	.00	.69	10.2	(4.5)	25	6.0	(3.5)	26	.00	.93
● Family Resource Scale[▲] (FRS) (range 30 to 150)	119.0	(14.1)	36	116.0	(19.5)	31	.47	-.21	118.7	(13.2)	25	117.4	(20.7)	26	.79	-.10
● Family Inventory of Life[♦] Events (FILE) (range 0 to 71)	7.8	(4.8)	36	12.2	(8.2)	31	.01	-.92	7.4	(4.9)	25	11.4	(7.3)	26	.03	-.82
● Family Support Scale (FSS)[δ] Total Score (range 0 to 4)	1.9	(0.7)	35	2.2	(0.8)	30	.11	.43	1.8	(0.7)	24	2.2	(0.8)	26	.08	.57
● Peabody Picture Vocabulary[&] Test - Revised (PPVT)	82.6	(18.9)	35	93.7	(14.8)	31	.01	.59	82.6	(17.9)	25	91.9	(19.8)	26	.09	.52

[*] Statistical analyses for BDI scores were conducted using raw scores for each of the scales; p-value and ESs are based on these raw score analyses. For ease in interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[△] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[▲] Analysis of the FRS is based on raw scores indicating the number of resources reported by the family as being available. Higher scores are considered better.

[♦] Analysis for the PSI and FILE are based on raw scores. Lower scores are considered better.

[δ] Analysis for the FSS is based on the sum of the perceived support score divided by the number of sources of support available. Higher scores are considered better.

[&] Analysis for the PPVT are based on standard scores. Although this measure was obtained at posttest, it addresses comparability and is presented here.

$$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center only)}}{\text{SD (Center Only)}}$$

The sign of the ES is reversed for the PSI, FILE, and FACES, as lower scores are preferred.

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Selection of covariates. The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance, and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table.

Measures of Child Functioning

Results of posttest data analysis on child functioning for Posttest #1, #2, and #3 are presented in Table 12.13, and for Posttest #4 in Table 12.14.

Posttest #1. After one year of intervention, results from the BDI show statistically significant differences ($p < .10$) on the adaptive behavior and communication domains in favor of the Center + PIE group. Statistically significant differences were not found on other domains, nor on the Total BDI score. Statistically significant differences were not found on the Joseph Preschool and

Table 12.13

Posttest Measures of Child Functioning for Posttest #1, #2, and #3 for Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates[♦]	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	P Value	ES[^]
POSTTEST #1												
Average length of intervention in program days	---	134.7	(29.0)		42	133.1	(31.8)		34	.05	.83	-.06
Age in months at posttest	---	59.9	(11.7)		42	59.3	(11.6)		34	.05	.82	-.05
Battelle developmental Inventory[*] (BDI)												
Personal/Social	20,1	118.2	(24.6)	115.3	42	116.1	(25.9)	118.9	34	.77	.38	.15
Adaptive Behavior	1,6	75.0	(15.0)	71.8	42	72.9	(20.9)	76.1	34	3.68	.06	.29
Motor	1	112.4	(23.4)	108.0	42	102.4	(28.6)	106.9	34	.09	.76	-.05
Communication	1	58.4	(16.0)	55.3	42	57.9	(21.1)	61.0	34	4.11	.05	.36
Cognitive	1	51.9	(16.4)	49.1	42	49.0	(17.9)	51.8	34	.95	.33	.16
TOTAL	1	415.9	(82.9)	398.5	42	398.4	(103.9)	415.7	34	2.37	.13	.21
Stanford-Binet[+]	1	75.6	(18.8)	73.3	28	72.1	(15.9)	74.4	19	.06	.81	.06
Joseph Preschool Primary[*] Self-Concept Inventory	2	19.5	(5.8)	19.2	11	20.9	(4.1)	21.2	7	1.57	.23	.34
POSTTEST #2												
Average length of intervention[$] in program days	---	197.2	(82.1)		37	220.8	(77.4)		33	1.51	.22	.29
Age in months at posttest	---	70.9	(12.2)		37	71.6	(12.5)		33	.07	.80	.06
Battelle developmental Inventory[*] (BDI)												
Personal/Social	3	132.8	(25.4)	130.7	37	128.5	(32.6)	130.6	33	.00	.99	-.00
Adaptive Behavior	1,14	89.3	(18.0)	86.0	37	84.5	(20.1)	87.9	33	.59	.45	.11
Motor	2	120.9	(28.8)	116.8	37	111.6	(32.9)	115.7	33	.15	.70	-.04
Communication	16	68.0	(18.9)	67.2	37	66.6	(23.2)	67.3	33	.00	.96	.01
Cognitive	17,12	65.7	(23.0)	64.5	37	64.9	(25.4)	66.1	33	.31	.58	.07
TOTAL	3,12	476.7	(97.7)	463.8	37	456.1	(124.5)	469.0	33	.18	.68	.05
Joseph Preschool Primary[*] Self-Concept Inventory	3	22.2	(6.4)	22.1	32	23.7	(4.3)	23.8	29	1.87	.18	.27
POSTTEST #3												
Age in months at posttest	---	83.8	(12.1)		37	83.7	(11.7)		31	.00	.98	.01
Battelle developmental Inventory[*] (BDI)												
Personal/Social	3,25	146.4	(17.2)	144.6	37	143.8	(27.7)	145.6	31	.07	.79	.06
Adaptive Behavior	1	97.5	(15.5)	94.9	37	94.3	(21.3)	97.0	31	.55	.46	.14
Motor	2,25	130.4	(23.1)	125.6	37	121.7	(33.1)	126.4	31	.08	.78	.03
Communication	16	77.7	(20.9)	77.0	37	76.1	(25.2)	76.8	31	.00	.94	-.01
Cognitive	17	75.0	(22.8)	75.5	37	73.3	(25.8)	72.8	31	.67	.42	-.12
TOTAL	3,25	526.9	(88.9)	517.4	37	509.1	(125.0)	518.5	31	.01	.93	.01
Joseph Preschool Primary[*] Self-Concept Inventory		23.3	(4.4)	23.3	31	25.0	(3.5)	25.0	24	2.35	.13	.39

---

[*] Statistical analysis for BDI and JSI were conducted using raw scores for each of the scales and these are presented.

[^] Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977 for a more general discussion of the concept of Effect Size).

[♦] Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

[+] Statistical analysis for the Stanford-Binet were conducted using IQ scores.

[$] Data represents days in center-based preschool program combined across Posttest #1 and #2.

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Table 12.14

Posttest #4 Measures of Child Functioning for the Des Moines Parent Involvement Study

		Center Only				Center + PIE						
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES˜
Age in months at posttest	---	95.5	(12.9)		25	95.5	(11.7)		26	.07	.79	.08
Woodcock-Johnson Test of Achiev.*												
Broad Knowledge	3,29	45.2	(15.0)	43.9	25	42.3	(17.5)	43.6	26	.01	.93	-.02
Skills	3,29	46.6	(28.3)	44.3	25	42.5	(26.2)	44.8	26	.01	.91	.02
Scales of Independent Beh.*												
Motor Skills	2,25	463.6	(20.8)	457.1	25	454.0	(41.1)	460.4	26	.37	.55	.16
Social/Communication	3	465.5	(16.4)	463.5	25	463.0	(21.9)	465.0	26	.20	.65	.09
Personal Living	2,25,12	473.1	(15.8)	467.9	25	465.4	(26.2)	470.7	26	.80	.38	.18
Community Living	3	444.6	(27.0)	441.8	25	440.8	(27.7)	443.6	26	.15	.70	.07
Broad Independence	3	461.8	(18.5)	459.3	25	455.8	(27.8)	458.4	26	.06	.81	-.05
Joseph Total*	26	24.5	(5.7)	24.3	20	25.1	(3.5)	25.3	19	.48	.49	.18
Teacher SPECS˙												
Communication	1	6.6	(1.7)	6.4	20	7.0	(1.6)	7.1	22	1.93	.17	.41
Sensory Motor	1	16.9	(2.3)	16.6	20	16.7	(2.6)	17.1	22	.40	.53	.22
Physical	1	12.6	(1.9)	12.4	20	12.8	(1.9)	13.0	21	1.01	.32	.32
Self Regulation	1	14.5	(3.4)	14.2	20	15.1	(3.0)	15.3	22	1.25	.27	.32
Cognition	1	6.3	(2.4)	6.0	20	6.9	(1.8)	7.2	22	3.87	.06	.50
Self-Social	1	13.9	(3.6)	13.2	20	14.6	(3.0)	15.2	22	5.32	.03	.56

* Statistical analysis for BDI, SIB, and JSI were conducted using raw scores for each of the scales and these are presented (weighted raw scores on the SIB).

˜ $$ES = \frac{\text{Adj.}\bar{x}\text{ (Center + PIE)} - \text{Adj.}\bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$$

♦ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child

˙ The SPECS were completed by each child's teacher. The raw scores possible for each domain are: Communication, 2 to 10; sensory motor, 4 to 20; Physical, 3 to 15; self-regulation, 4 to 20; Cognition, 2 to 10; and self/social, 4 to 20. Higher scores are preferred.

Primary Self-Concept Inventory (JSI) nor on the Stanford-Binet. These results suggest that the parent involvement program did impact on child developmental gains.

Posttest #2. Results from Posttest #2 are also presented in Table 12.13. Information on the Stanford-Binet is not included for this analysis. The Stanford-Binet was not administered after the 1986-87 academic year. As mentioned earlier, Posttest #2 analyses include subjects who "graduated" to school-age programs as well as those who received two consecutive years of intervention. No group differences were found on any of the BDI domains or total score. Results from the JSI also indicate no group differences. These data indicate that any positive effects of the parent involvement were not maintained over time. These data are confounded by the

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implementation of the PIE II curriculum for some parents. This potential confound will be examined in analyses presented later in this report.

Posttest #3. Table 12.13 also includes child measure results from Posttest #3. No group differences were found on the BDI or JSI.

Posttest #4. Results from Posttest #4 are presented in Table 12.14. The child measures used at this posttest represent an entirely different instrument battery. However, the results are consistent with the findings of Posttests #2 and #3. No statistically significant differences were found between groups on the Woodcock-Johnson Tests of Achievement, on the Scales of Independent Behavior, nor on the JSI.

Also included on Table 12.14 are the teacher completed SPECS. Four of the six scales assessed by this measure show no difference between the groups (sensory-motor, physical, communication, and self-regulation). Of the two other scales, the results from the cognition and self-control scales indicate a difference between groups in favor of the Center + PIE group. These results are promising, but further confirmation is necessary. The data presented are on Cohort #1 only and results from Cohort #2 may influence the results. Cohort #2's data will not be available until Spring 1991. Another indication of the strength of this result will occur on the cross posttest analyses of these data (to be presented).

Measures of Family Functioning

Table 12.15 presents data on parent and family functioning for Posttests #1, #2, #3, and #4. A significant difference was also found on the CES-D. Mothers in the Center + PIE group reported less depression symptomatology. This finding could be associated with the increased support perceived by these mothers.

Posttest #1. Families in the Center + PIE group were found to have more sources of support available to them based on scores from the Family Support Scale. It is possible that the support component of the PIE influenced actual or perceptions of support which lead to this finding.

Table 12.15

Posttest Measures of Family Functioning for Des Moines Study

		POSTTEST #1													**POSTTEST #2**												
		Center Only					Center + PIE								Center Only					Center + PIE							
Variable	Covariates*	x̄	(SD)	Adj.x̄	%ile	n	x̄	(SD)	Adj.x̄	%ile	n	ANCOVA F	P Value	ES^	x̄	(SD)	Adj.x̄	%ile	n	x̄	(SD)	Adj.x̄	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																											
Child Related	5	118.2	(21.7)	117.3	86	41	112.8	(16.5)	113.7	80	34	1.32	.25	.17	119.0	(20.7)	118.8	88	35	118.5	(17.0)	118.6	88	32	.00	.96	.01
Other Related	6	134.5	(24.1)	134.2	72	41	129.6	(26.2)	129.9	66	34	1.85	.18	.18	129.2	(20.1)	130.4	66	35	133.2	(28.0)	131.9	70	32	.14	.71	-.07
TOTAL	4	252.7	(39.8)	251.4	81	41	242.4	(38.1)	243.6	75	34	2.32	.13	.20	248.2	(35.5)	249.2	79	35	251.6	(39.6)	250.6	81	32	.05	.82	-.04
Family Support Scale (FSS)♦♦																											
TOTAL	9,**10**	1.5	(.8)	1.6		39	2.1	(.6)	2.0		34	8.34	.01	.50	1.7	(.8)	1.8		23	2.1	(.9)	2.0		24	.60	.44	.25
Family Resource Scale (FRS)♦																											
TOTAL	10,**9**,11	121.5	(17.0)	119.8	54	41	117.7	(18.9)	119.4	51	34	.02	.89	-.02	125.8	(14.6)	123.0	59	35	114.4	(24.8)	117.1	48	33	2.46	.12	-.40
Family Adaptation° Cohesion Eval. (FACES)																											
Cohesion	**7**,6,20	5.5	(4.4)	5.0		41	4.8	(3.9)	5.3		33	.07	.80	-.07	5.9	(5.0)	5.5		35	5.6	(4.9)	6.0		32	.32	.58	-.10
Adaptation	**19,12**,10,22	6.3	(3.6)	5.6		41	4.9	(3.2)	5.6		33	.00	.99	.00	4.8	(3.6)	4.6		35	5.4	(3.5)	5.6		32	1.60	.21	-.28
TOTAL	7,**14**	9.1	(4.3)	8.3		41	7.7	(3.6)	8.6		33	.10	.76	-.07	8.6	(4.6)	7.6		35	8.6	(4.7)	9.6		32	3.61	.06	-.43
Discrepancy	8	10.3	(8.8)	10.8		41	12.6	(9.4)	12.1		33	.50	.48	-.14	10.2	(9.6)	10.7		35	11.6	(7.2)	11.1		31	.06	.81	-.04
Family Inventory of° Life Events (FILE)	11,**6**,10,19	7.4	(5.4)	8.7	47	41	10.8	(6.9)	9.5	40	34	.87	.36	-.15	6.1	(5.0)	8.3	55	24	9.7	(7.4)	7.5	55	25	.17	.68	.16
Child Improvement## (Locus of Control)																											
Professional	**18**	18.7	(2.8)	18.9		41	19.9	(4.3)	19.6		34	.74	.39	.25	19.9	(4.5)	19.9		36	19.3	(3.8)	19.3		32	.46	.50	-.13
Divine Intervention	**14,12**,23	12.5	(3.3)	12.1		41	11.4	(3.5)	11.9		34	.09	.76	-.06	11.5	(3.4)	11.2		36	11.6	(3.6)	11.8		32	.38	.54	.18
Parent		23.4	(2.5)	23.4		41	23.9	(3.1)	23.9		34	.66	.42	.20	23.8	(2.8)	23.8		36	23.9	(3.2)	23.9		32	.02	.89	.04
Child	**5,12**,13	21.3	(3.0)	21.0		41	19.8	(4.2)	20.1		34	1.20	.28	-.30	21.9	(4.0)	21.5		36	19.4	(3.8)	19.8		32	3.67	.06	-.43
Chance	**13,12**,7	11.6	(3.7)	11.2		41	9.3	(3.1)	9.7		34	3.73	.06	-.41	12.7	(4.6)	12.3		36	9.7	(3.2)	10.1		32	4.59	.04	-.48
TOTAL	**5,12**,7	87.6	(10.0)	86.4		41	84.3	(10.2)	85.5		34	.19	.66	-.09	89.9	(14.3)	89.0		36	83.9	(9.2)	84.8		32	1.83	.18	-.29
CES-D Depression#	6	31.6	(9.0)	31.5		41	28.4	(8.6)	28.4		34	2.88	.09	.34	29.1	(6.7)	29.4		36	33.8	(12.0)	33.5		33	4.37	.04	-.61
Parent as a Teacher♦ Scale (PAAT)																											
Creativity	**17,13**,5	25.8	(1.3)	25.9		11	27.3	(3.0)	27.1		8	2.50	.14	.92	26.7	(1.6)	26.7		34	27.0	(2.7)	27.0		32	.30	.58	.19
Frustration	**17,13**,3,4	26.7	(1.4)	26.7		11	26.4	(2.6)	26.4		8	.07	.80	-.21	27.0	(2.1)	27.1		34	26.7	(3.1)	26.6		32	.63	.43	-.24
Control	1,7	25.3	(2.8)	25.3		11	27.0	(2.1)	27.0		8	2.17	.16	.61	25.7	(2.7)	26.0		34	27.0	(2.6)	26.7		32	1.29	.26	.26
Play	4,7	27.2	(2.1)	27.2		11	29.0	(1.9)	29.0		8	3.74	.07	.86	28.9	(2.5)	29.0		34	29.3	(2.9)	29.1		32	.02	.90	.04
Teaching/Learning	**21**,5,7	27.8	(1.3)	28.6		11	29.5	(2.3)	28.7		8	.02	.88	.08	28.7	(2.7)	28.9		34	29.7	(3.0)	29.5		32	.93	.34	.22
TOTAL	**17,13**,4,7	132.8	(5.2)	133.1		11	139.1	(9.4)	138.8		8	4.92	.04	1.10	137.0	(8.3)	137.8		34	139.7	(11.5)	138.9		32	.25	.62	.13

(continued)

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^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI, FACES, FILE, and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI, FILE, and CES-D were based on raw scores where low raw scores are most desirable.

° Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

* Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child. Covariate numbers in standard type were used for both Posttest #1 and #2, **bold** numbers were used for Posttest #1 only, underlined numbers were used for Posttest #2 only.

## On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

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Table 12.15 (continued)

Posttest Measures of Family Functioning for Des Moines Study

		POSTTEST #3													POSTTEST #4													
		Center Only					Center + PIE								Center Only					Center + PIE								
Variable	Covariates˚	x̄	(SD)	Adj.x̄	%ile	n	x̄	(SD)	Adj.x̄	%ile	n	ANCOVA F	P Value	ES^	x̄	(SD)	Adj.x̄	%ile	n	x̄	(SD)	Adj.x̄	%ile	n	ANCOVA F	P Value	ES^
Parent Stress Index (PSI)#																											
Child Related	5,**7**	116.0	(18.5)	114.1	80	37	112.5	(22.4)	114.4	80	31	.01	.94	-.02	113.0	(22.0)	113.1	79	24	111.4	(22.0)	111.3	76	24	.12	.74	.08
Other Related	**3,13**,6	129.8	(21.0)	130.7	68	37	130.3	(27.1)	129.4	65	31	.11	.74	.06	126.7	(31.3)	127.8	63	24	126.5	(27.7)	125.3	58	24	.23	.63	.08
TOTAL	**4**	245.8	(34.4)	247.3	78	37	242.8	(45.2)	241.3	72	31	.64	.43	.17	239.7	(51.0)	241.0	72	24	237.9	(44.2)	236.6	68	24	.23	.63	.09
Family Support Scale (FSS)♦♦																											
TOTAL	**26**,9,1	1.8	(.7)	1.8		12	1.8	(.6)	1.8		8	.00	.99	.00	2.0	(.8)	2.0		23	1.9	(.8)	1.8		23	.62	.44	-.25
Family Resource Scale (FRS)♦																											
TOTAL	10,6,9	122.7	(12.8)	121.6	57	37	120.3	(23.9)	121.5	57	31	.00	.98	-.01	124.9	(12.9)	123.1	59	23	121.6	(23.9)	123.5	61	24	.02	.90	.03
Family Adaptation˙ Cohesion Eval. (FACES)																											
Cohesion	**20**	5.7	(3.9)	5.4		37	4.2	(3.3)	4.5		31	1.26	.27	.23	5.4	(3.8)	5.4		24	4.7	(4.0)	4.7		24	.37	.55	.18
Adaptation	**7**,19	5.2	(3.1)	4.8		37	4.6	(3.1)	5.0		31	.03	.87	-.06	4.1	(2.9)	3.3		24	3.8	(2.2)	4.5		24	1.86	.18	-.41
TOTAL	**7**,9	8.2	(4.1)	7.6		37	7.0	(3.3)	7.6		31	.00	.98	.00	7.3	(3.8)	7.1		24	6.6	(3.8)	6.8		24	.07	.79	.08
Discrepancy	8,11	10.1	(9.4)	10.2		37	11.9	(7.8)	11.7		31	.61	.44	-.16	11.9	(8.3)	11.2		24	9.3	(9.4)	10.0		24	.30	.59	.14
Child Improvement˙# (Locus of Control)																											
Professional	16	18.3	(4.2)	18.3		37	18.8	(4.2)	18.8		31	.24	.63	.12	18.9	(4.3)	19.0		24	19.0	(4.0)	18.9		24	.01	.93	-.02
Divine Intervention	**27**,21,12	12.3	(3.6)	12.4		37	11.9	(3.6)	11.8		31	.55	.46	-.17	12.5	(3.3)	12.0		24	10.8	(3.9)	11.4		24	.35	.56	-.18
Parent	**25**,**28**	22.3	(3.9)	22.4		37	24.0	(2.8)	23.9		31	3.52	.07	.38	23.7	(3.4)	23.7		24	24.6	(2.7)	24.6		24	1.15	.29	.26
Child	**18**,12	21.4	(3.0)	20.9		37	21.0	(3.9)	21.5		31	.42	.52	.20	22.3	(2.6)	21.8		24	20.8	(4.2)	21.2		24	.28	.60	-.23
Chance	23,**14**,23,13	12.1	(4.1)	11.6		37	9.5	(3.0)	10.0		31	4.47	.04	-.39	11.3	(3.8)	10.8		24	9.1	(3.3)	9.6		24	2.63	.11	-.32
TOTAL	23,12	86.4	(12.8)	85.7		37	85.1	(9.9)	85.7		31	.00	.99	.00	88.7	(10.9)	87.0		24	84.3	(9.1)	85.9		24	.21	.65	-.10
CES-D Depression#	**6,12**	31.3	(9.4)	30.8		37	30.3	(8.4)	30.8		30	.00	.99	.00													
Parent as a Teacher♦ Scale (PAAT)																											
Creativity	**6,9,19**,5	26.8	(1.8)	26.6		33	26.6	(2.0)	26.8		30	.18	.67	.11	26.6	(2.7)	26.6		24	26.2	(2.2)	26.2		24	.43	.51	-.15
Frustration	**6**,5,30	27.0	(1.9)	27.0		33	27.2	(2.6)	27.3		30	.36	.55	.16	28.0	(3.0)	27.9		24	26.8	(1.6)	26.9		24	2.65	.11	-.33
Control	**9,7**,12	25.3	(2.8)	25.8		33	27.5	(2.5)	27.0		30	3.36	.07	.43	25.3	(2.5)	25.6		24	26.5	(2.2)	26.2		24	.70	.41	.24
Play	**6**,9	29.2	(2.6)	29.1		33	29.8	(2.6)	29.9		30	1.75	.19	.31	29.5	(2.6)	29.8		24	29.2	(2.1)	29.0		24	1.54	.22	-.31
Teaching/Learning	**6**,9	28.9	(2.8)	29.1		33	29.6	(2.6)	29.5		30	.29	.59	.14	30.2	(3.7)	30.6		24	29.3	(3.1)	28.9		24	3.31	.08	-.46
TOTAL	5,9	137.2	(8.4)	137.2		33	140.8	(9.0)	140.8		30	2.72	.10	.43	139.7	(10.6)	140.4		24	138.0	(8.0)	137.2		24	1.85	.18	-.30

^ Effect Size (ES) is defined here as the difference between the groups (Center + PIE minus Center Only) on the ANCOVA adjusted scores, divided by the unadjusted standard deviation of the Center Only Intervention Group (see Glass, 1976; Tallmadge, 1977; and Cohen, 1977, for a more general discussion of the concept of Effect Size). For the PSI, FACES, FILE, and CES-D, the numerator for the ES is reversed, as lower scores are preferred.

Statistical analysis for the PSI, FILE, and CES-D were based on raw scores where low raw scores are most desirable.

˙ Scores for each subscale of the FACES are derived from an "ideal" score. Scores reported in the table indicate distance from the "ideal" where a score of 0 is considered best.

♦ Statistical analyses for the FRS and PAAT were based on raw scores where higher scores are preferred.

♦♦ Analyses for the FSS is based on the sum of the preferred support scored divided by the number of scores of support available. Higher scores are preferred.

˚ Covariates: 1 = BDI adaptive; 2 = BDI motor; 3 = BDI Total; 4 = PSI Total; 5 = PSI Child; 6 = PSI other; 7 = FACES Total; 8 = FACES Discrepancy; 9 = FSS Total; 10 = FRS Total; 11 = FILE Total; 12 = PPVT Standard Score; 13 = Income; 14 = Mother Education; 15 = Hours of Daycare; 16 = Battelle Communication; 17 = Battelle Cognitive; 18 = Mothers Age; 19 = Adaptation; 20 = Cohesion; 21 = Siblings in home; 22 = FACES Perceived raw score; 23 = Ethnicity of child; 24 = FSS Total Support; 25 = Age of child at pretest; 26 = BDI Personal-Social; 27 = Ethnicity of Mother; 28 = Primary caretaker; 29 = Sex of child; 30 = Mother living with child. Covariate numbers in standard type were used for both Posttest #3 and #4, **bold** numbers were used for Posttest #3 only, underlined numbers were used for Posttest #4 only.

˙# On the Child Improvement Questionnaire, ESs are used only to indicate direction of result. See text for interpretation of findings. Statistical analyses are based on raw scores.

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A differences was found on one subscale of the Child Improvement Questionnaire (CIQ) which assesses locus of control perceptions. The CIQ was designed to measure parental beliefs concerning control over the improvement of children who are physically, emotionally, or developmentally impaired. A significant difference was found on the chance subscale. The subscale assesses parental beliefs that their child's improvement is largely a matter of fate or of factors beyond their control. Parents of children in the Center + PIE group were significantly less likely to believe their child's progress was due to fate. A change away from believing fate is controlling child improvement is a change that may be associated with PIE. One goal of the PIE was to help the parents improve their intervention skills to increase the perceptions of themselves as a factor in their child's improvement. Therefore, change in the parent subscale of the CIQ was expected, but did not occur. This failure to find a difference decreases confidence in the parent empowerment aspects of the PIE.

Finally, significant differences were found on the total score and play subscale of the Parent as Teacher Scale in favor of the Center + PIE group. These results, though, must be viewed with caution as the subject n is small. Only Cohort #2 subjects received this measure at Posttest #1.

In addition to the analyses reported in Table 12.15, the subscales of the PSI were analyzed. Some caution is suggested when making interpretations based on these results, as the PSI authors recommend against using the subscales for interpretive purposes. These subscales were analyzed here for exploratory purposes. On the subscales, a significant difference was found in parents' stress regarding their sense of competence, with those parents in the Center + PIE group viewing themselves as more competent (less stressed). No differences were found on the 12 other subscales that compare the PSI.

The results from measures of family functioning should be interpreted conservatively. The majority of comparisons show no differences between groups. The results of the FSS may be a treatment verification variable indicating that support was indeed provided as part of the PIE. It is also possible that in conducting as many analyses as were done here that findings of significance may occur, even when groups are comparable. The overall effects of the Center + PIE intervention on family functioning appears to be negligible.

Posttest #2. A significant difference between groups was found on the FACES Total score (Table 12.15). Families of Center-Only subjects reported more appropriate family functioning. This result suggests family functioning closer to "ideal" functioning. If these FACES differences maintain over time, it would suggest a negative effect of parent-focused interventions such as the PIE.

Differences were found on the child and chance subscales of the Child Improvement Questionnaire. The finding on the chance subscale repeats that found at Posttest #1. Center + PIE families were significantly less likely to believe their child's progress was due to fate. Center + PIE parents also attributed less of their child's progress to their child (i.e., within child attributions). Both of these differences could be attributed to the parent involvement component.

A significant difference was again found on the CES-D, but this time favoring the Center-Only group. This finding is the reverse of what occurred at Posttest #1.

Overall, the results from family measures suggest that the only clear place the parent involvement may have affected families in on their attributions of progress in their child. Other impacts seem negligible. Once again, it should be noted that some children and parents continued in intervention at this posttest, while others did not. This confound will be examined in later analyses.

Posttest #3. Results from this posttest are presented in Table 12.15. Differences between the groups occurred on the parent and chance scales of the CIQ, and on the control scale and total score of the PAAT. The results from the CIQ suggest that parents in the Center + PIE group view themselves as being an agent of change in their child's progress. This is a desired outcome of the parent involvement. Also, the finding that parents in the Center + PIE group are less likely to attribute their child's progress is consistent with earlier posttests. The result from the PAAT suggest that the parents of children in the Center + PIE group exert more control over their child during interactions and engage, overall, in more positive teaching interactions with their child. This result is also positive toward the parent involvement component. Overall, though, the impact of the parent involvement component is negligible on most aspects of family functioning.

Posttest #4. Table 12.15 presents results from this posttest. Only one difference between groups was found at this posttest. Parents of children in the Center-Only group reported more positive teacher learning situations on the PAAT. Posttest #4 results, overall, show no group differences. Even the positive attributions of child progress of the Center + PIE group have faded at this posttest.

Parent/Child Interaction

It was possible that the alternative forms of intervention may have affected parent/child interactions in a way that was not detected by the family measures. Preliminary results from other EIRI studies provided evidence which suggested parent/child interactions may have been impacted by the parent involvement component. In order to determine if the alternative interventions had an effect on parent/child interactions, these interactions were assessed during the posttesting that occurred in 1990.

All children who were posttested in 1990, and had parents who consented, were videotaped in a structured parent/child interaction situation. These children included subjects in Cohort #1 and #2. Therefore, some subjects were being tested for Posttest #3 and others for Posttest #4. The parent (typically mothers) and child were videotaped using a structured videotape protocol. Videotapes were scored using the Parental Behavior Rating Scale (Mahoney, Finger, & Powell, 1985) by observers trained and supervised by the scale developer, Gerald Mahoney.

The Parental Behavior Rating Scale assesses 12 factors that relate to parent/child interaction: expressiveness, enjoyment, warmth, sensitivity to child's interest, responsivity, achievement orientation, inventiveness, verbal praise, effectiveness, pace, acceptance, and directiveness. (Definitions of these factors can be obtained by writing EIRI or Dr. Mahoney.) Each factor is scored from 1 to 5, with 5 indicating greater amounts of the factor being measured. These 12 factors were divided into 3 major aspects (encompassing 10 factors) of parent/child interaction based on a factor analysis. These three aspects are:

1. ***Affect*** combines the scores from expressiveness, enjoyment, warmth, and acceptance. Affect assesses aspects of parent enjoyment with and emotional responses toward the child.
2. ***Reciprocation*** combines scores from the sensitivity to child's interest, responsivity, and effectiveness factors. Reciprocation assesses aspects of the parent's responsiveness to child initiations and parent ability to maintain engagement in interactions.
3. ***Control*** combines scores from achievement orientation, pace, and directiveness. This aspect assesses areas related to the parent's control of the interaction.

An analysis of covariance was conducted on scores from each of the 12 factors and from the 3 major aspects. Covariates were selected in the manner described earlier. No significant differences were found between groups on individual factors or major aspects. The results from the major aspects are presented in Table 12.16. These results indicate that aspects of parent/child interaction were not impacted by the parent involvement component.

Classroom Follow-Up

Another possible impact of the parent involvement component may occur once the child is in an elementary school placement. To assess this, teachers of children

Table 12.16

Measures of Parent/Child Interaction for Des Moines Parent Involvement Study

		Center-Only				Center + PIE						
Variable	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
Chronological age at taping (months)	--	91.2	(12.8)		29	92.8	(12.1)		27	.22	.64	.13
Affect (range 4 to 20)	1,2	10.7	(2.7)	11.1	26	11.6	(2.4)	11.3	27	.15	.70	.07
Reciprocation (range 3 to 15)	1	8.5	(2.4)	8.4	29	9.1	(2.4)	9.1	27	1.23	.27	.29
Control (range 3 to 15)	1	6.2	(1.6)	6.2	29	6.9	(2.1)	6.9	27	2.58	.11	.44

* 1 = CA at taping; 2 = Income

^ $$ES = \frac{\text{Adj.}\bar{x}\ (\text{Center + PIE}) - \text{Adj.}\bar{x}\ (\text{Center-Only})}{\text{SD (Center-Only)}}$$

in the study were contacted at the end of the 1989/90 school year for child information. Teachers were asked to complete a questionnaire that requested information on the child and the child's classroom placement. Information was requested on the teacher's perception of the child's parents, as well as some teacher specific and general classroom information. Teachers were also requested to complete a SPECS on the child.

Teachers were not informed of the specific purpose of the research or given any information that the child had been in an early intervention program for children with disabilities. Teachers who received these questionnaires had been identified by the parent as the child's teacher when permission to contact teachers was obtained. Fifty-five teachers, representing 71 subjects, were contacted; 45 returned information, representing 58 subjects. Of these 58 subjects, 42 were Cohort #1 subjects and 16 were Cohort #2 subjects.

Information obtained from these teachers is presented in Tables 12.17 and 12.18. Table 12.17 presents descriptive information, by number of children, on grade placement, type of mainstreaming that occurs, and primary classroom placement. The majority of children are in self-contained, special education placements. The grade these children are in varies from preschool to second grade. A large group

Table 12.17

Descriptive Information on School Placement by Numbers of Subjects for Des Moines Parent Involvement Study

	Center-Only (n = 28)	Center + PIE (n = 30)
GRADE		
Preschool/Kindergarten[^]	6	6
1st	4	7
2nd	5	3
Mixed Grade[*]	13	13
MAINSTREAMED[#]		
Not Mainstreamed	9	8
Academic Mainstreaming[+]	1	3
Nonacademic Mainstreaming	9	7
All day Mainstreaming	8	6
PRIMARY PLACEMENT		
Typical Class	1	6
Typical Class + Resource	6	4
Self-Contained Class	21	20

[*] All mixed grade were in self-contained placements

[+] Includes academic and nonacademic mainstream placements, as long as subject is mainstreamed for some academic subjects.

[^] Child may remain in a preschool placement through age six.

[#] Only includes children who are not in a typical class placement.

of children (46%) are in mixed grade self-contained classrooms. Of those children who are not in a typical placement, a variety of mainstreaming options were found.

Comparative information on child-classroom placement variables are presented in Table 12.18. No significant differences were found on any of the variables examined except for percent in a typical classroom placement. Significantly more subjects in the Center + PIE group are in a typical placement. Overall, the majority of children remain classified in special education and receive some related services. There is a trend for subjects in the Center + PIE group toward more preferred outcomes based on the finding of all positive effect sizes. However, the failure to find significant differences requires that longitudinal findings be obtained to confirm or refute this trend.

Table 12.18

Teacher Reported Data for Des Moines Parent Involvement Study

		Center-Only			Center + PIE				
Variables	Covariates*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Chronological age of child in months on 6/1/90		92.1	(14.0)	28	93.7	(12.3)	30	.64	.11
• Child Variables♦									
Percent in self-contained♣ placement		74.1		27	66.7		30	.55	.19
Percent in typical classroom placement		3.6		28	20.0		30	.05	.73
Percent with special♣ education classification		92.9		28	83.3		30	.27	.40
Percent receiving special♣ service therapies		78.6		28	70.0		30	.47	.24
Percent anticipated for♣ special education placement in following year		62.3		27	42.9		28	.14	.47
• Ratings of Parents▲									
Attendance		2.3	(.8)	27	2.6	(.7)	30	.09	.38
Knowledge		2.0	(.8)	27	2.3	(.8)	30	.15	.38
Cooperation		2.2	(.7)	27	2.4	(.8)	30	.29	.29
• SPECδ									
Sensorimotor	1	16.6	(2.2)	26	17.0	(2.5)	29	.54	.18
Physical	1	12.6	(1.7)	26	13.0	(1.8)	28	.36	.24
Self-regulation	1	14.6	(3.1)	26	15.0	(3.1)	29	.66	.13
Cognition	2	6.3	(2.2)	26	6.7	(1.7)	29	.40	.18
Self/Social	3	14.2	(3.4)	26	14.6	(3.3)	29	.60	.12
Communication	4	6.5	(1.7)	26	6.9	(1.4)	29	.38	.24

* Covariates: 1 = BDI adaptive, 2 = BDI cognitive, 3 = BDI total, 4 = BDI communication

♦ Statistical analyses for these variables were based on a t-test where subjects possessing the trait were scored "1" and those not possessing the trait were scored "0." ESs for these variables are based on a probit transformation.

▲ Parent ratings are scored from 1 to 3, where higher scores are preferred. Results are from t-tests.

δ SPECS results are from analyses of covariance on the raw scores. Possible raw scores for the domains are: sensorimotor, 4 to 20; physical, 3 to 15; self-regulation, 4 to 20; cognition, 2 to 10; self-social, 4 to 20; and communication, 2 to 10. Higher scores are preferred. Adjusted means are presented in the table.

^ $$ES = \frac{\bar{x}\text{ (Center + PIE)} - \bar{x}\text{ (Center-Only)}}{\text{SD (Center-Only)}}$$

♣ The sign of the effect size for these variables was reversed as lower percentages are preferred.

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Teachers were also asked to rate parents in three areas (attendance, knowledge, and cooperation) based on their interactions with the parents. A significant difference was found on teacher ratings of parent attendance (i.e., at PTA meetings, IEP meetings, parent-teacher conferences, etc.) in favor of the Center + PIE group (Table 12.18). No other significant differences were found.

Results from the teacher-completed SPECS are presented in Table 12.18. These data and results are different from those presented in Table 12.14, as these results combine subjects at Posttests #3 and #4. No significant differences were found on any of the SPECS domains in this analysis. These results suggest that the earlier significant results from the SPECS be cautiously interpreted until all Posttest #4 data are collected.

Analysis of One Year vs. Two Years of Intervention

In the analyses presented earlier for Posttests #2, #3, and #4, the existence of a possible confound was mentioned. This possible confound is that the Center + PIE group consists of subjects who received two years of parent involvement intervention and subjects who received one year of parent involvement intervention. The analyses reported in this section was conducted to determine the effects of these different durations of parent involvement on the data collected.

A oneway analysis of covariance was conducted on all child and family outcome measures, reported earlier, for Posttests #2, #3, and #4. The groups compared were the Center-Only group, the group who received one year of the parent involvement intervention (Center + PIE), and the group who received two years of the parent involvement intervention (Center + PIE I + PIE II). Covariates used in the analyses were the same as those reported for each measure on the earlier analyses (Tables 12.13 - 12.15).

The majority of results from these analyses are presented in Table 12.19. This table does not present data on all measures in order to simplify the table. Any measure where a significant difference between groups was found is presented in the table.

No significant differences were found on the majority of the measures. The measures on which a significant difference ($p < .10$) was found are presented with further analyses in Table 12.20. Overall, the results from Table 12.19 suggest that the different durations of participation in the parent involvement component was not a confound that impacted on earlier data analyses.

Table 12.20 presented information regarding the direction of differences for the measures on which a significant difference was found in Table 12.19. This table presents the effect size for each possible two-group comparison and a probability value based on that effect size.

Posttest #2. It is interesting to note that the group (Center + PIE I + PIE II) who received the most parent involvement was reporting the highest levels of depression symptomatology, significantly more than the Center-Only group. On the chance scale of the CIQ, the results indicate that the Center + PIE I + PIE II attributed significantly less of their child's progress to chance than either the Center-Only group or the Center + PIE I group. In fact, the Center-Only and Center + PIE I groups did not differ on this measure. Also, the Center + PIE I + PIE II group attributed significantly more of their child's progress to professionals than the Center + PIE I group, while the Center-Only group attributed significantly less of their child's progress to professionals than the Center + PIE I group.

Posttest #3. The significant finding on the CIQ chance subscale reflect those found at Posttest #2. The findings on the PAAT suggest that the Center + PIE I + PIE II group was less frustrated and more appropriately playful with their child than the Center-Only group. Also, the Center + PIE I and Center + PIE I + PIE II

Table 12.19

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

	Center-Only			Center + PIE I			Center + PIE I + PIE II				
Variables*	Adj. $\bar{x}$^	(SD)	n	Adj. $\bar{x}$^	(SD)	n	Adj. $\bar{x}$^	(SD)	n	ANCOVA F	p Value
POSTTEST #2											
• Battelle Developmental Inventory											
Personal/Social	130.9	(25.4)	37	128.3	(34.1)	14	132.8	(31.0)	19	.24	.79
Adaptive Behavior	85.6	(18.0)	37	87.2	(20.3)	14	87.8	(18.0)	19	.30	.74
Motor	116.3	(24.8)	37	113.5	(34.6)	14	116.7	(30.9)	19	.36	.70
Communication	67.6	(18.9)	37	65.8	(24.8)	14	69.2	(21.7)	19	.34	.71
Cognitive	65.1	(23.0)	37	62.9	(24.9)	14	69.6	(24.9)	19	1.31	.28
TOTAL	463.5	(97.7)	37	461.0	(129.2)	14	474.7	(115.9)	19	.38	.69
• Parenting Stress Index (Total)♦	249.3	(35.5)	35	246.0	(21.9)	13	254.1	(48.3)	19	.38	.68
• Family Adaptation and Cohesion+ Evaluation Scales (Total)	7.3	(4.6)	35	9.4	(4.2)	14	9.2	(5.2)	18	1.78	.18
• CES-D♦	29.4	(6.7)	36	32.1	(10.7)	14	34.7	(13.0)	19	2.58	.08
• Child Improvement Questionnaire											
Professional	19.9	(4.5)	36	17.2	(3.4)	13	20.7	(3.5)	19	3.14	.05
Divine Intervention	11.2	(3.4)	36	12.5	(2.9)	13	11.2	(4.0)	19	.80	.46
Parent	23.8	(2.8)	36	23.4	(3.6)	13	24.3	(2.9)	19	.38	.69
Child	21.5	(4.0)	36	20.5	(3.3)	13	19.3	(3.9)	19	2.27	.11
Chance	12.2	(4.6)	36	11.5	(3.3)	13	8.9	(2.8)	19	4.07	.02
TOTAL	88.8	(14.3)	36	85.4	(9.6)	13	83.9	(9.2)	19	.96	.39
• Parent as a Teacher (PAAT)											
Creativity	26.7	(1.6)	34	26.4	(1.3)	13	27.5	(3.3)	19	1.27	.29
Frustration	27.1	(2.1)	34	26.0	(1.6)	13	27.1	(3.7)	19	1.08	.35
Control	26.0	(2.7)	34	26.6	(2.0)	13	26.9	(3.0)	19	.71	.50
Play	29.1	(2.5)	34	28.3	(1.9)	13	29.8	(3.3)	19	1.59	.21
Teaching/Learning	28.9	(2.7)	34	29.3	(2.2)	13	29.8	(3.4)	19	.62	.54
TOTAL	138.0	(8.3)	34	135.9	(5.1)	13	141.5	(14.1)	19	1.73	.19

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* Oneway analyses of covariance were conducted on raw scores for all variables listed except the FACES.

+ Scores for the FACES are derived from an "ideal" score, where a score of "0" is preferred.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

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Table 12.19 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

Variables*	Center-Only			Center + PIE I			Center + PIE I + PIE II				
	Adj. $\bar{x}$^	(SD)	n	Adj. $\bar{x}$^	(SD)	n	Adj. $\bar{x}$^	(SD)	n	ANCOVA F	p Value
POSTTEST #3											
• Battelle Developmental Inventory											
Personal/Social	144.5	(17.2)	37	143.2	(29.8)	13	147.3	(26.6)	18	.29	.75
Adaptive Behavior	94.5	(15.5)	37	93.8	(20.6)	13	98.9	(22.0)	18	1.01	.37
Motor	124.8	(23.1)	37	124.4	(34.2)	13	126.5	(32.4)	18	.14	.87
Communication	77.5	(20.9)	37	74.4	(29.3)	13	79.4	(21.8)	18	.53	.59
Cognitive	76.7	(22.8)	37	68.5	(27.1)	13	77.9	(24.7)	18	2.03	.14
TOTAL	517.6	(89.0)	37	508.0	(135.1)	13	526.7	(117.7)	18	.42	.66
• Parenting Stress Index (Total)♦	247.4	(34.4)	37	237.9	(32.8)	13	244.0	(52.7)	18	.46	.63
• Family Adaptation and Cohesion♣ Evaluation Scales (Total)	7.4	(4.1)	37	7.9	(3.2)	13	7.0	(3.4)	18	.31	.74
• CES-D♦	30.6	(9.4)	37	31.4	(9.4)	12	29.9	(8.0)	18	.13	.88
• Child Improvement Questionnaire											
Professional	18.3	(4.2)	37	17.0	(4.8)	13	20.1	(3.3)	18	2.21	.12
Divine Intervention	12.5	(3.6)	37	11.6	(4.2)	13	12.0	(3.1)	18	.33	.72
Parent	22.4	(3.9)	37	23.2	(3.2)	13	24.4	(2.2)	18	2.28	.11
Child	20.8	(3.0)	37	21.7	(4.5)	13	21.1	(3.4)	18	.34	.71
Chance	11.5	(4.1)	37	10.9	(3.4)	13	9.1	(2.4)	18	3.85	.03
TOTAL	85.5	(12.8)	37	84.6	(13.1)	13	86.1	(7.1)	18	.08	.93
• Parent as a Teacher (PAAT)											
Creativity	26.6	(1.8)	33	26.8	(1.9)	12	26.8	(2.1)	18	.09	.91
Frustration	27.0	(1.9)	33	26.2	(1.9)	12	28.0	(2.9)	18	3.16	.05
Control	25.9	(2.8)	33	27.5	(2.4)	12	27.0	(2.6)	18	1.80	.18
Play	29.1	(2.6)	33	29.0	(2.6)	12	30.5	(2.6)	18	2.41	.10
Teaching/Learning	29.2	(2.8)	33	28.5	(2.4)	12	30.3	(2.6)	18	2.01	.14
TOTAL	137.2	(8.4)	33	139.0	(7.6)	12	142.1	(9.8)	18	1.80	.17

* Oneway analyses of covariance were conducted on raw scores for all variables listed except the FACES.

♣ Scores for the FACES are derived from an "ideal" score, where a score of "0" is preferred.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

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Table 12.19 (continued)

Oneway Analysis of Covariance Results on Child and Family Outcome Measures for Center-Only Subjects and Subjects Receiving One (Center + PIE I) or Two Years (Center + PIE I + PIE II) of Parent Involvement Activities for Des Moines Parent Involvement Study

Variables*	Center-Only			Center + PIE I			Center + PIE I + PIE II				
	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n	Adj.$\bar{x}$^	(SD)	n	ANCOVA F	p Value
POSTTEST #4											
• Woodcock-Johnson											
Broad Knowledge	45.2	(15.0)	25	35.6	(21.4)	7	49.0	(16.6)	19	5.02	.01
Skills	46.6	(28.3)	25	39.2	(28.6)	7	50.5	(25.6)	19	1.18	.32
• Scales of Independent Behavior											
Motor	457.9	(20.8)	25	458.8	(41.6)	7	462.2	(41.1)	19	.24	.79
Social & Communication	465.1	(16.4)	25	460.4	(28.2)	7	469.2	(19.7)	19	1.41	.25
Personal Living	468.4	(17.8)	25	472.3	(27.0)	7	470.8	(25.2)	19	.43	.66
Community Living	444.1	(27.0)	25	445.6	(26.4)	7	446.1	(26.7)	19	.07	.93
TOTAL	461.4	(18.5)	25	457.6	(29.8)	7	461.6	(26.7)	19	.22	.80
• Parenting Stress Index (Total)♦	240.1	(51.0)	24	229.3	(45.3)	6	237.8	(44.4)	18	.27	.77
• Family Adaptation and Cohesion♣ Evaluation Scales (Total)	7.0	(3.8)	24	6.4	(1.7)	6	6.8	(4.3)	18	.06	.94
• Child Improvement Questionnaire											
Professional	18.9	(4.3)	24	17.6	(5.2)	6	19.2	(3.5)	18	.36	.70
Divine Intervention	12.0	(3.3)	24	11.3	(3.6)	6	11.4	(4.1)	18	.17	.84
Parent	23.7	(3.4)	24	24.7	(2.2)	6	24.6	(3.0)	18	.57	.57
Child	21.7	(2.6)	24	20.9	(3.6)	6	21.3	(4.5)	18	.17	.85
Chance	10.8	(3.8)	24	10.2	(4.3)	6	9.4	(2.9)	18	1.54	.23
TOTAL	86.8	(10.9)	24	84.9	(8.1)	6	86.0	(9.7)	18	.14	.87
• Parent as a Teacher (PAAT)											
Creativity	26.6	(2.7)	24	26.7	(1.6)	6	26.0	(2.3)	18	.37	.69
Frustration	27.9	(3.0)	24	26.2	(1.2)	6	27.1	(1.8)	18	1.69	.20
Control	25.7	(2.5)	24	26.3	(1.0)	6	26.2	(2.5)	18	.35	.71
Play	29.9	(2.6)	24	28.8	(2.2)	6	29.2	(2.1)	18	.85	.44
Teaching/Learning	30.7	(3.7)	24	29.3	(4.2)	6	29.0	(2.8)	18	1.64	.21
TOTAL	140.8	(10.6)	24	137.0	(8.0)	6	137.8	(8.3)	18	.93	.40
• SPECS											
Communication	6.6	(1.7)	20	6.7	(1.1)	7	7.0	(1.7)	16	.34	.71
Sensorimotor	16.8	(2.3)	20	16.3	(1.5)	7	17.5	(2.9)	16	.66	.52
Physical	12.4	(1.9)	20	12.5	(1.9)	7	13.4	(1.9)	15	1.21	.31
Self-Regulation	14.5	(3.4)	20	14.7	(3.7)	7	15.2	(2.7)	16	.21	.81
Cognition	6.3	(2.4)	20	5.5	(1.5)	7	7.7	(1.7)	16	4.49	.02
Self/Social	13.8	(3.6)	20	13.2	(3.7)	7	16.1	(2.7)	16	4.12	.02

*Oneway analyses of covariance were conducted on raw scores for all variables listed except the FACES.

♣ Scores for the FACES are derived from an "ideal" score, where a score of "0" is preferred.

♦ Lower scores are preferred

^ Adjusted means are presented. Covariates used were the same as those reported in Tables 12.13 - 12.15.

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Table 12.20

Direction of Significant Results from Oneway Analysis of Covariance (Table 12.19) for Des Moines Parent Involvement Study

	Center Only vs. Center + PIE I		Center Only vs. Center + PIE I + PIE II		Center + PIE I vs. Center + PIE I + PIE II	
Variable	ES*	p♦ Value	ES*	p♦ Value	ES*	p♦ Value
POSTTEST #2						
• CES-D	.34	.29	.60	.04	.22	.55
• Child Improvement Questionnaire						
Professional	-.66	.05	.18	.54	1.02	.01
Chance	-.17	.62	-.82	.01	-.86	.02
POSTTEST #3						
• Child Improvement Questionnaire						
Chance	.27	.42	-.68	.02	-.66	.08
• PAAT						
Frustration	-.43	.21	.49	.10	.76	.05
Play	-.04	.90	.55	.07	.06	.13
POSTTEST #4						
• Woodcock-Johnson						
Broad Knowledge	-.59	.17	.24	.44	.75	.10
• SPEC						
Cognition	-.37	.42	.67	.05	1.33	.01
Self/Social	-.18	.68	.72	.04	.99	.04

* ES was computed by subtracting the Adj.$\bar{x}$ of the second listed group from the mean of the first listed group and dividing this by the pooled SD for the two groups. For example:

$$\frac{\text{Adj.}\bar{x}\cdot(\text{Center + PIE I + PIE II}) - \text{Adj.}\bar{x}\ (\text{Center + PIE I})}{\text{SD (Pooled)}}$$

♦ The p value was obtained by converting the ES into a t-score and taking the p value for that t-score.

groups significantly differed on their frustration levels with the Center + PIE I + PIE II group reporting less frustration.

Posttest #4. The results from Posttest #4 are interesting in that the differences are in areas of child functioning rather than in areas assessing parent perceptions. The results in Table 12.20 all suggest an advantage for children whose parents were in the Center + PIE I + PIE II group over the Center + PIE I group, and over the Center-Only group. These data are not based on the entire study sample and, therefore, a cautious interpretation of results is required.

Treatment Verification Analyses

An analysis of the treatment verification data was conducted. The finding of group differences on the intervenor rating of parents (Table 12.5) raised questions regarding the reason for this difference. That is, did the PIE intervention provide parents with skills that enabled them to interact more effectively with teachers, or were the ratings the result of other factors (as pretest differences did exist between groups)? The relation of parent attendance at group meetings (by Center + PIE group parents) and parent satisfaction with intervenor ratings were other issues that were of interest.

Correlational analyses were conducted to begin the examination of these issues. Correlations of parent attendance (by Center + PIE group parents), intervenor ratings of parents (for all parents), and parent satisfaction (for all parents) with treatment verification measures, family demographic characteristics, and information from posttest family measures were conducted. Correlations with family measures and the majority of demographic characteristics revealed no significant correlations. Data presented in Table 12.21 represent correlations that provide some interesting findings regarding the current data and raise suggestions for further analyses. Intervenor ratings of parents appear influenced by a number of factors, primarily parent education and income; although child attendance at school and lack of child progress in school also affected intervenor ratings. When these demographic factors were included in an Analysis of Covariance with intervenor rating (sum of the three areas) as dependent variable and treatment group as independent variable, no differences between groups were found ($\underline{F}$ = 2.46, ES = 0.38, $\underline{p}$ = .13).

Table 12.21

Correlational Analyses of Treatment Verification Data For Des Moines Parent Training Study

Variable	Parent Attendance$^{\&}$		Intervenor Rating$^{\wedge}$		Parent Satisfaction$^{\#}$	
	r	p	r	p	r	p
• Mother's education	.32	07	.56	< .000	.11	.25
• Father's education	.37	05	.51	< .000	-.03	.41
• Family income	.42	03	.61	< .000	15	.17
• Child school attendance	22	10	.23	.06	04	.40
• Parent attendance$^{\&}$	—	—	.55	.002	.00	.50
• Intervenor rating$^{\wedge}$	.55	.002	---	---	.06	.33
• Parent satisfaction$^{\#}$	.00	.50	.06	.33	---	---
• Child progress$^{'}$	-.12	.26	-.20	06	.04	.38

& Based on actual parent attendance at PIE I meetings.

^ Based on the sum of three questions assessing parent support, knowledge, and attendance as perceived by the teacher at Posttest #1.

Based on seven questions assessing parent satisfaction obtained at Posttest #1.

' Child progress is based on difference in BDI total raw score from Pretest to Posttest #1.

These findings also suggested that the teacher ratings from the classroom follow-up be repeated with covariates. If teachers are affected by these parent factors in preschool, then these factors could affect teachers at other levels. Analyses of covariance were conducted on the teacher-provided ratings of attendance, knowledge, and cooperation (Table 12.18) using parent income and mother education as covariates. These analyses did change the results of all three analyses. Parent attendance was no longer significantly different ($F = .84$, $p = .37$, ES = .14) between groups. The effect size for parent knowledge (ES = .13) decreased while the ES for parent cooperation was unaffected.

Parent education and income was also associated with parent attendance at PIE meetings. Perhaps parents with higher levels of education are more comfortable in a class-like setting and are more willing to attend regularly. Unlike parent attendance at meetings and intervenor ratings, parent satisfaction with the Center-

Based intervention program is unrelated with parent education, child progress, or intervenor perception. A number of possibilities arise: (a) more sensitive measures of satisfaction may be needed; (b) parents may not have a clear idea of what represents a good versus poor program; or (c) parents may be truly satisfied.

These treatment verification analyses raise interesting questions for the field of early intervention. Evaluations in the past have overlooked these variables and as a result may have obtained biased data (Casto & Mastropieri, 1986; Cooke & Poole, 1982). These initial analyses make clear the importance of verification data. Verification data cannot only help clarify results obtained, but also raise new areas for investigation.

Conclusions

This study investigated the effect on children, parents, and families of placement in a center-based early intervention program supplemented by parent-attended meetings focused primarily on training parents intervention skills, compared to the same program without the parent component. Results of this study indicate that the supplemental parent involvement component had a minor impact on children's developmental progress immediately after intervention, but this progress was not maintained over time or by the continuation of a parent involvement intervention. The only aspect of parent or family functioning consistently impacted was that parents who received the parent involvement component were less likely than other parents to attribute their child's developmental progress to chance. These impacts occurred at a cost of approximately $1,700 per child for the parent involvement component.

It is difficult to succinctly summarize the results of such a comprehensive study. There are measures where a significant difference is found at one posttest but not the next. It is difficult to determine if these differences are true differences or random fluctuations within a large data set. Actual differences must be demonstrated by consistent findings within a posttest and across posttests. Such consistency was not evidenced on the majority of measures.

Data from longitudinal aspects of this study that are examining teacher judgments and child classroom placements are providing some promising initial results in favor of the Center + PIE group. These results, however, must be viewed cautiously at this time. Longitudinal data will determine if these differences are actual, sustained differences or merely random fluctuations in the data.

It is clear that the parent component used in this study is only one type of parent involvement possible from a continuum of parent involvement options. The parent component used in this study, though, is representative of the most common approach to parent involvement (White et al., 1989) (i.e., parent meetings focused on training intervention skills as a supplement to a center-based program). The findings from this study do not imply that parent involvement is not beneficial nor that parents cannot be effective interventionists for their child with disabilities. These results only imply that parent involvement, when conducted as described in this study, does not provide long-term benefits for child development or for family functioning.

In interpreting the results of this study, it should be remembered that parent attendance at meetings was far from perfect. However, attendance at parent meetings in this study typifies findings when using lower SES groups (Baker & McCurry, 1984). Regardless of attendance, parents learned the concepts taught in PIE I (Test of Parent Knowledge), at least at a level that allowed them to verbalize information presented. This is probably due to the repeated presentation of critical knowledge in PIE, as in many other parent curricula providing information (Innocenti, Rule, & Fiechtl, 1989). These factors further support the "typical" nature of this intervention.

This study represents a methodologically-sound analysis of one type of parent involvement in the form of parent meetings focused on training parents as interventionists as a supplement to center-based intervention services. The results of this study do not endorse this type of intervention if the goal is to make a sustained impact on child development or family functioning. This type of parent involvement may be defensible from a social/ethical perspective.

Regardless of arguments for or against this type of parent involvement, this study demonstrates that questions regarding parent involvement can be addressed with methodologically sound experimental studies. Research such as this will help to define not only what types of parent involvement "work," but will also help the field of early intervention elucidate its arguments for involving parents. Whatever the role of parents is determined to be, it should be one that is both empirically and logically defensible.

UTAH PARENT INVOLVEMENT STUDY (1986)

Project #13

Comparison: Moderately to Severely Handicapped Children--Center-based intervention plus parent training versus center-based intervention only.

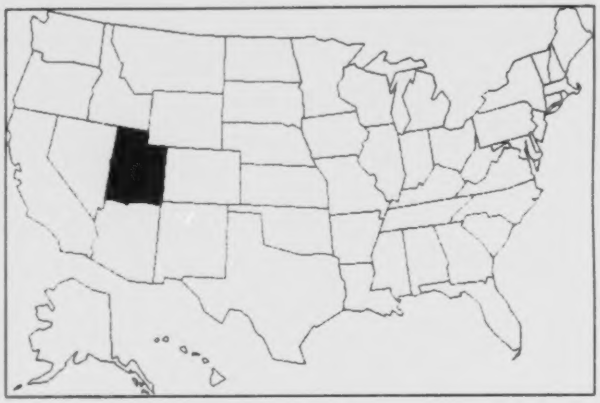
Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

E|RI Coordinator: Glenna Boyce, Ph.D.

Location: Salt Lake City, Utah

Date of Report: 4-10-1991

Rationale for Study



The involvement of parents in their children's education has long been considered important. White et al. (1989) identified six rationales frequently cited as to why parental involvement is necessary: (1) Parents are responsible for the welfare of their children; (2) Involved parents provide better political support and advocacy; (3) Early intervention programs which involve parents are more effective; (4) By involving parents, the same outcome can be achieved at less cost; (5) The benefits of early intervention are maintained better if parents are involved; and (6) Parent involvement provides benefits to parents and family members as well as the child. The last four of these rationales can be and have been, to some extent, subjected to scientific investigation, but as yet, there are few data which demonstrates how and if such involvement leads to better child outcomes or benefits for the family (White et al., 1989).

Methodologically sound studies which examine the effects of various types of parent involvement are needed.

Research also has yet to demonstrate if any of the many types of parent involvement (i.e., see White et al., 1989, Table 1) has been identified as being clearly the best (Powell, 1986). However, programs which use parents to assist in delivering therapeutic activities (that are designed to enhance the child's development) are the most frequent manner in which past research has defined parent involvement (White et al., 1989). Theoretically, such parent involvement should produce child gains as parents and teachers become more effective partners working together on behalf of the child.

This study investigated the immediate and long-term effects of a parent involvement program which was primarily designed to involve parents in delivering therapeutic activities, thereby enhancing the development progress of their child with a disability. Second, it was hoped that the program would benefit parents by providing them with a forum which allowed them to form liaisons and seek support from other parents with preschoolers with disabilities. In addition to assessing the impact of parent involvement on child progress measures, this study assessed the effects of such a program on the family. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1979; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Additionally, most previous studies were conducted with children who are disadvantaged; children with moderate and severe disabilities may present sufficiently different problems so that the relationship between a parent-as-therapist program and overall family functioning may not be present or at least may be different.

This study is very similar to the Utah Parent Involvement 1985 study and to the Des Moines study reported elsewhere in this document. This study differs from the Des Moines study in that the children in this study are younger than those at Des Moines and the site for this study, Developmental Disabilities, Inc. (DDI), is a private, non-profit; agency while the Des Moines study is being conducted at a public school. (The Utah Parent Involvement studies diverge from Des Moines after first posttest in that the Des Moines site implemented a follow-up or maintenance intervention while the Utah studies did not.) This study is close to a direct replication of the Utah Parent Involvement 1985 study in its methodology, although there are slight differences in the instruments used in assessment. (For example, a measure of home environment called the HOME is used in the Utah Parent Involvement 1985 study, but not in the Utah Parent Involvement 1986 study.) For the most part, however, the Des Moines and Utah Parent Involvement 1985 and 1986 studies use the same procedures and methods of assessment. These three studies provide a systematic and concurrent replication of each other. The literature on parent involvement has been severely criticized for the lack of replication and limited generalizability of its studies (Clarke-Stewart, 1982).

Review of Related Research

Historically, the involvement of parents in their children's education has been considered to be a vital component of successful programs for both normal and disadvantaged children. Founded upon a belief in the importance of parent-child interaction and built on the idea that families were the primary source of values and behaviors of children, parent involvement has been seen by many social scientists, practitioners, and advocates as a way to solve a variety of societal problems. The Head Start program, which served as a guide for many subsequent early intervention projects, included a parent involvement component as an integral part of its activities. Bronfenbrenner's (1974) report was especially influential in arguing that early intervention with children who are disadvantaged was more effective when parents were involved in the program, asserting that the increased participation of parents provided the value change that led parents to encourage and reward their children's learning activities. Lazar's (1981) oft cited analysis of 14 studies of early intervention for children who are disadvantaged with follow-up data reaffirmed this contention in finding that direct participation of parents was significantly related to positive program outcomes.

The benefits associated with parent involvement are believed to be well established both for normal and disadvantaged children. IQ gains and fewer special education placements have been frequently cited in the literature. Haskins and Adams (1982, p. 364), in a critical review of parent education, concluded, "Even a conservative interpretation would indicate that parent intervention programs can, under some circumstances, produce long-term IQ gains in children." Children's sociability and cooperation may also show significant gains (Clarke-Stewart, 1982). Increased infant responsiveness, improvement in children's school performance, and positive effects on maternal behavior (more facilitative language, flexible child-rearing patterns, awareness of parental role as educator) have also been found (Powell, 1986). Some of these effects would appear to be long-lasting; for example, one study found that the Yale Child Welfare parent involvement program still had a positive impact on family circumstances ten years after the intervention had ended (Seitz et al., 1985). Another study found that children of parents involved in long-term parent instruction programs were less likely to be enrolled in special education classes 7 years after the conclusion of the intervention (Jester & Guinagh, 1983). Although these benefits are impressive, a thorough understanding of all the variables involved is not yet complete. In many of the studies which showed substantial child benefits, parent involvement was just one of several components in the interaction programs and the research was not designed to determine which elements were the critical components. Also, Clarke-Stewart (1982) and Apfel (1978) have cautioned that although immediate effects are often achieved, most follow-up studies show effects are not permanent or very long-lasting. The controversy over the endurance of benefits associated with parent involvement programs points to the need for more longitudinal research in this area.

The research discussed thus far has generally been conducted with children who are disadvantaged. Because such programs have been considered to be effective with this population (and with more general populations as well), it was logical to extend them into use with families of children with disabilities. The number of self-help groups formed by parents of children with disabilities would seem to support a perceived need for assistance to parents in this area. The recent passage of P.L. 99-457, which mandates involvement of the family in the young child's education, also asserts the federal government's acceptance of the belief that effective education of the child must include the child's family. Parent education and instructional programs are a frequently used means of attempting to involve families and provide opportunities for parents to learn to work effectively with and for their children with disabilities. As Foster, Berger, and McLean (1981, p. 55) noted, "Parent involvement is a good idea that has become an essential and often unquestioned component of intervention programs for young handicapped children."

However, White et al. (1989) have questioned whether parent involvement truly produces positive benefits to children, citing major problems with the integrity of the literature. Few studies of parent involvement with children with disabilities were found to be methodologically sound. A number of studies in this area utilize only indirect comparisons (that is, parent involvement is one of several experimentally manipulated variables [e.g., setting or age at start]). Clarke-Stewart (1982) noted that often no control or comparison group is used, and random assignment is almost never featured, giving rise to questions about selection effects.

Other limitations in the research have been indicated. Often, treatment verification has not taken place to confirm that treatment was received by the parent as it was intended by the researcher. Also, the foci of the research has often been limited to child outcome measures. Studies have not been concerned with family effects, although many researchers have argued that the benefits of parent involvement are greater than those demonstrated by the target child (Dunst, 1986). Another limitation is that few studies have given cost-benefit information, despite general claims that parent involvement saves money.

Finally, a major limitation in the research so far stems from the fact that parent involvement has been defined in many ways (White et al., 1989). Two general types of parent involvement have been identified (Gatling & White, 1987): (1) Those that use parents in some way to enhance the child's developmental progress (parent-as-therapist), and (2) Those that provide assistance to parents or other family members to enhance family functioning, coping ability, satisfaction, or ability to manage the stress of having a handicapped child as a family member (family support). About 80% of the studies of parent involvement analyzed by White et al. (1989) used a parents-as-therapist approach as either the sole focus or as the major focus of a parent involvement program which involved several other components. Often the parent instruction curriculum has been added to a center-based intervention program. Since the type of program is typical, studies are needed to assess its benefits. Such a study needs to be a well-designed, longitudinal study that involves replication, random assignment to treatment and control groups, treatment verification, and multiple measures of child and family functioning. Only then can the numerous questions concerning costs and effects of parent instruction components begin to be addressed.

Overview of Study

The long-term effectiveness of adding a parent involvement component with a parent-as-therapist focus to an on-going center-based intervention program was investigated in this study. Fifty-six children with moderate to severe disabilities had been in a ½-day, 5-day-per-week, center-based preschool program in the Salt Lake City, Utah, area. The children were randomly assigned to either the center-based intervention plus parent involvement component or the center-based only intervention. The parents of the children in the parent involvement group took part in the Parents Involved in Education (PIE) program, which consisted of 15 1½ hour weekly training sessions from January through April, 1987. The parents of the other children (the center-based or comparison group) did not participate in the PIE program. All children were tested prior to, immediately after, and once yearly for three more years following the implementation of the parenting groups, making a total of four posttests. Parents also completed measures of family functioning at each posttest.

Method

Subjects

Preschool children with moderate to severe disabilities and their families who were participating in an intervention program for children with disabilities were considered for inclusion in this study. The preschool intervention program was offered through the services of the Developmental Disabilities, Inc. (DDI), a private, non-profit agency located in Salt Lake City, Utah. The Battelle Developmental Inventory was used as a screening instrument to determine children's eligibility for services. Children scoring at 1½ standard deviations below the mean in at least two areas, or 3 standard deviations below the mean in one area qualified for services at the center.

Recruitment. Parents of eligible children were sent a letter inviting them to participate in the research. Sixty-seven parents responded, but nine were unable to participate due to reasons such as lack of transportation, illness, etc. Thus, 58 subjects were pretested but two dropped out of the program after the pretest. Parents signed an informed consent letter which stated their willingness to be randomly assigned to either group (center-based or center-based + PIE). The informed consent letter also specified other responsibilities of the parent, the intervention program and the research staff. Subject recruitment was completed in November, 1986.

Assignment to groups. Subjects who met the criteria for inclusion were randomly assigned to one of two treatment groups. Prior to the initiation of treatment, parents were either assigned to a group in which they participated in parent instruction based on the PIE curriculum or to a group in which parents received no additional instruction. The parents not receiving the PIE curriculum continued to receive the same level of parent involvement that was previously available through the center's program for preschoolers with disabilities.

To increase the probability of comparable groups, subjects were assigned to groups randomly, after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their developmental test scores obtained from the Battelle Developmental Inventory and other assessment instruments previously administered as part of the eligibility process for receiving services at the intervention center. After subjects were categorized and rank ordered within categories, the subject with the lowest DQ score in each cell was randomly assigned and others were alternately assigned to one of the two conditions.

Demographic characteristics. The children in the sample, at the pretest, ranged in age from 23 to 61 months, with the average being 42 months. Most of the parents were in their late twenties or early thirties. As a group, the parents were fairly well educated with the average education for both mothers and fathers being more than 13 years. Most of the families were Caucasian, and the demographic data indicates that most of them would be considered middle class. Typically, the children were living with both parents and a majority of the mothers (66%) did not report any hours of work. An average of two siblings were reported, making the average number of children per family three (including the child with a disability). Table 13.1 presents a demographic comparison of the center-based group and the center-based + PIE group at pretest time. Twenty-nine subjects were in each group. The mean age for children in the center-based + PIE group was 41.6 months, and for children in the center-based group was 43.0 months. The only finding of note was that fathers in the center-based group were older (p = .07) than fathers in the center-based + PIE group. Otherwise, p-values for the demographic variables ranged from 1.0 to .13, indicating that the groups were roughly comparable in terms of demographic characteristics.

Attrition. Two subjects dropped out between the time of the pretest and the Posttest #1. One of these subjects cited the birth of a new baby and a language barrier (the subject was a recent immigrant) as reasons for dropping out of the study and out of services altogether. The other subject dropped out of the study because the mother decided to withdraw her child from services at the intervention center. Thus, the sample at first posttest consisted of 56 subjects, with 28 in each group.

Data from 40 subjects were available for the analysis of second posttest testing with 16 subjects not participating. Of these 16, 7 subjects dropped from the study at the time of second posttest due to lack of interest, and 1 subject declined to participate due to the death of the father the week before the second posttest

Table 13.1

Comparison on Key Demographic Variables of the Center-Based and Parent Involvement Groups in the 1986 Parent Involvement Study

All Subjects Included in Analysis

	Center-Based			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
• Age of child in months as of 11/15/86	43.0	10.5	28	41.6	10.6	28	.62	-.13
• Age of mother in years	33.4	5.8	28	31.3	4.5	27	.13	.36
• Age of father in years	35.9	6.2	27	33.1	5.1	27	.07	.45
• Percent Male*	57.1		28	42.9		28	.31	.26
• Years of Education--Mother	13.8	1.7	28	13.5	1.6	27	.54	-.18
• Years of Education--Father	13.8	2.1	28	14.0	2.1	27	.76	.10
• Percent with both parents living at home*	78.6		28	92.9		28	.17	.36
• Percent of children who are caucasian*	82.1		28	92.9		28	.29	.28
• Hours per week mother employed	8.4	13.7	26	6.0	10.7	27	.48	.18
• Hours per week father employed	42.8	15.5	21	36.4	19.2	25	.23	.41
• Percent of mothers employed as technical managerial or above*	10.7		28	3.7		27	.43	-.21
• Percent of fathers employed as technical managerial or above*	61.5		26	44.0		25	.23	-.32
• Total household income'	$21,785	$12,728	28	$22,480	$13,237	26	.84	.05
• Percent with mother as primary caregiver*	100.0		28	96.4		28	.57	-.15
• Percent of children in daycare more than 5 hours per week*	14.3		28	7.4		27	.49	-.18
• Number of siblings	2.1	1.7	28	2.3	1.1	27	.70	.12
• Percent with English as primary language*	96.4		28	96.4		28	1.00	0
• Maternal PPVT (standard)§	99.6	18.0	28	99.3	17.1	27	.95	-.02

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[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

['] Income data were converted from categorical to continuous data by using the midpoint of each category.

[^] Effect size is defined here as the difference between the groups (expanded intervention minus basic) on the ANCOVA scores, divided by the unadjusted standard deviation of the basic intervention group. (See Glass, 1976; Tallmadge, 1977; & Cohen, 1977, for a more general discussion of the concept of Effect Size.) The sign of ES only indicates direction of difference; no value judgement is intended.

[§] Maternal PPVT measures mother's vocabulary. It correlates highly with IQ measures. This measure was taken at Posttest #1, but was considered a pretest variable.

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testing. Two subjects moved, one to El Paso and one to Nevada, and four other subjects could not be located. (Standard procedure for locating lost subjects was first, to contact next of kin, and second, to send a certified letter. For these cases, neither procedure proved successful.) Finally, two children do not have Battelle Developmental Scores, but have family measure scores. Thus, second posttest data was available for 20 subjects in the comparison group and 20 subjects in the parent instruction group.

At Posttest #3, substantial efforts were made to retrieve subjects not tested at Posttest #2; 51 children and their families completed the measures (25 in the parent involvement group and 26 in the center-based group), leaving 5 who were not tested. Two of these lived in states where testers could not be located, the mothers of two who refused to participate at Posttest #2 refused to be reinstated, and one was not located.

The participation remained high at Posttest #4 with 52 children and their families tested. All four children who were not tested were from the parent involvement group. Two of these had declined to participate since Posttest #1, one died in December, 1989, and one's mother declined to participate this year.

A comparison of subjects who were tested at the time of the second, third and fourth posttests with those who were not tested at the same posttest may be found in Tables 13.2, 13.3, and 13.4, respectively. Tests of statistical significance were used in comparing those families tested with those not tested. Because of the relatively few children who left the study, tests of statistical significance for the interaction between group membership and those who remained in and left the study were not done. The mean pretest developmental scores (BDI Total DQ) of children not tested at Posttests #2 and #4 were lower (Posttest #2 $\underline{p}$ = .08 ES = .66; Posttest #4 $\underline{p}$ = .09, ES = .98) than the children tested; but at Posttest #3, the reverse was true with the mean pretest developmental score of the children not tested being higher

Table 13.2

Comparison on Pretest Variables of Subjects Who Withdrew from Study With Those Who Completed Posttest #2 in the 1986 Utah Parent Involvement Study

								Study Status							
		Center-Based			Center-Based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES**
Age at Pretest	IN	42.4	11.9	20	41.6	11.6	20	42.0	11.6	40	43.1	7.1	16	.73	-.09
	OUT	44.5	6.1	8	41.7	8.2	8								
BDI Total DQ	IN	58.6	15.5	20	62.0	10.5	20	60.3	13.2	40	51.6	22.1	16	.08	66
	OUT	49.1	18.8	8	54.1	25.9	8								
Total PSI	IN	255.7	53.6	20	257.2	31.7	19	256.4	43.8	39	250.4	37.6	16	.63	.14
	OUT	251.3	36.4	8	249.5	41.2	8								
Child Related PSI	IN	122.2	25.5	20	118.5	15.8	19	120.4	21.2	39	119.4	20.6	16	.88	.05
	OUT	124.1	18.7	8	114.6	22.5	8								
Other PSI	IN	133.6	31.3	20	138.7	20.5	19	136.1	26.4	39	131.0	25.0	16	.52	.19
	OUT	127.1	29.9	8	134.9	20.2	8								
Education Mother	IN	13.9	1.5	20	13.5	1.5	19	13.7	1.5	40	13.6	1.9	16	96	07
	OUT	13.6	2.2	8	13.6	1.8	8								
Education Father	IN	14.0	2.0	20	13.8	2.1	19	14.0	2.0	40	13.8	2.3	16	.72	.10
	OUT	13.3	2.3	8	14.3	2.4	8								
Income	IN	$22,325	$13,496	20	$21,944	$10,752	19	$22,712	$12,458	40	$22,066	$15,161	15	.87	.05
	OUT	$20,437	$11,296	8	$23,928	$19,490	7								
FACES	IN	9.0	6.0	20	6.5	2.8	19	7.7	4.9	39	6.1	3.6	16	.23	.33
	OUT	6.4	4.9	8	5.8	2.1	8								
Family Resources	IN	113.2	16.9	20	112.9	16.7	18	113.0	16.6	38	114.8	21.8	16	75	-.11
	OUT	117.8	22.0	8	111.8	22.6	8								
Family Support	IN	27.53	11.0	19	29.1	9.6	19	28.3	10.2	38	31.8	11.3	13	.31	-.34
	OUT	31.00	12.9	7	32.7	10.3	6								

** $ES = \frac{\bar{x}_{in} - \bar{x}_{out}}{SD_{in}}$

* The p value and ES are based on comparison of study status (i.e. in study, those who were tested at that posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

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Table 13.3

Comparison on Pretest Variables of Subjects Who Withdrew from Study With Those Who Completed Posttest #3 in the 1986 Utah Parent Involvement Study

								Study Status							
		Center-Based			Center-Based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p^* Value	ES$^{\wedge\wedge}$
Age at Pretest	IN	43.1	9.6	26	41.7	11.2	25	42.4	10.3	51	41.8	13.2	5	.91	.06
	OUT	42.1	26.2	2	41.6	2.5	3								
BDI Total DQ	IN	53.4	13.9	26	60.9	10.9	25	57.1	13.0	51	65.0	39.5	5	.31	-.61
	OUT	87.2	24.3	2	50.2	44.8	3								
Total PSI	IN	257.5	48.8	26	255.4	32.5	24	256.5	41.4	50	236.6	46.7	5	.32	.48
	OUT	214.5	33.2	2	251.3	54.8	3								
Child Related PSI	IN	123.2	24.1	26	118.2	16.1	24	120.8	20.6	50	112.8	23.9	5	.42	.39
	OUT	116.0	14.1	2	110.7	32.0	3								
Other PSI	IN	134.3	29.9	26	137.2	20.1	24	135.7	25.4	50	123.8	30.2	5	.33	.47
	OUT	98.5	19.1	2	140.7	24.1	3								
Education Mother	IN	13.8	1.7	26	13.5	1.4	24	13.6	1.6	50	13.8	2.2	5	.83	.13
	OUT	13.5	2.1	2	14.0	2.6	3								
Education Father	IN	13.8	2.1	26	13.8	2.0	24	13.8	2.1	50	14.6	2.5	5	.42	-.38
	OUT	13.5	2.1	2	15.3	2.9	3								
Income	IN	$21,653	$12,611	26	$22,282	$12,931	23	$21,948	$12,632	49	$23,800	$16,476	5	.76	-.15
	OUT	$23,500	$19,799	2	$24,000	$18,621	3								
FACES	IN	8.2	6.0	26	6.4	2.7	24	7.3	4.7	50	6.8	2.5	5	.82	.11
	OUT	8.9	2.7	2	5.4	1.2	3								
Family Resources	IN	113.0	18.0	26	113.6	17.0	23	113.3	17.4	49	116.0	26.6	5	.75	-.16
	OUT	133.5	6.4	2	104.3	29.7	3								
Family Support	IN	28.8	11.8	24	30.2	10.0	23	29.4	10.9	47	26.3	3.2	4	.56	.28
	OUT	25.0	.0	2	27.5	5.0	2								

^ $ES = \frac{\bar{x}_{in} - \bar{x}_{out}}{SD_{in}}$

* The p value and ES are based on comparison of study status (i.e. in study, those who were tested at that posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

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Table 13.4

Comparison on Pretest and Demographic Variables of Subjects Who Withdrew from Study With Those Who Completed Posttest #4 in the 1986 Utah Parent Involvement Study

								Study Status							
		Center-Based			Center-Based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES^*
Age at Pretest	IN	31.05	10.51	28	28.99	10.98	24	30.10	10.67	52	33.65	8.12	4	.52	-.33
	OUT				33.65	8.12	4								
BDI Total DQ	IN	55.86	16.72	28	62.33	12.10	24	58.84	14.99	52	44.18	29.84	4	.09	98
	OUT				44.18	29.84	4								
Total PSI	IN	254.43	48.70	28	259.52	29.57	23	256.73	40.89	51	228.50	51.18	4	.20	69
	OUT				228.50	51.18	4								
Child Related PSI	IN	122.71	23.46	28	119.61	15.08	23	121.31	19.99	51	104.25	27.95	4	.12	85
	OUT				104.25	27.95	4								
Other PSI	IN	131.71	30.57	28	139.91	18.97	23	135.41	26.01	51	124.25	24.10	4	.41	.43
	OUT				124.25	24.10	4								
Education Mother	IN	13.79	1.66	28	13.42	1.38	24	13.62	1.54	52	14.00	2.45	4	.65	-.25
	OUT				14.00	2.45	4								
Education Father	IN	13.79	2.08	28	13.83	2.10	24	13.81	2.07	52	15.25	2.22	4	.19	-.70
	OUT				15.25	2.22	4								
Income	IN	$21,785	$12,728	28	$22,282	$12,931	23	$22,009	$12,693	51	$29,250	$18,477	4	.29	-.57
	OUT				$29,250	$18,477	4								
FACES	IN	8.22	5.76	28	6.46	2.80	23	7.43	4.71	51	5.41	89	4	.40	.43
	OUT				5.41	.89	4								
Family Resources (FRS)	IN	114.46	18.20	28	111.64	17.08	22	113.22	17.59	50	117.50	26.41	4	.65	-.24
	OUT				117.50	26.41	4								
Family Support (FSS)	IN	28.46	11.37	26	29.32	10.00	22	28.85	10.76	48	34.67	6.35	3	.36	-.55
	OUT				34.67	6.35	3								

^ $ES = \frac{\bar{x}_{in} - \bar{x}_{out}}{SD_{in}}$

* The p value and ES are based on comparison of study status (i.e. in study, those who were tested at that posttest versus out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference; no value judgment is intended.

(p = .31, ES = -.61) than the pretest score of the children tested. These larger fluctuations in BDI scores seemed to be related to the small samples of four or five children who were not tested each time. Thus, there is no reason to believe that attrition substantially changed the results of the study at any posttest.

Intervention Programs

The purpose of this study was to compare a center-based intervention group with a center-based intervention group whose parents participated in one particular type of parent involvement. A description of these treatments follows.

Basic intervention (center-based treatment). Children in this treatment group attended an existing 3-hour-per-day, 5-day-per-week intervention program. A group of 9-12 children were instructed by a special education teacher who was assisted by a paraprofessional aide. The average number of children in the classrooms was 9.75. During a typical day, children were instructed in developmental areas such as motor, speech/language, self help, cognitive, and social skills. Instructional activities were developed from comprehensive assessments. Items were drawn from a number of curricula with no single, specific commercial curriculum being used to determine intervention goals and activities. Children received services in different educational formats (i.e., large group, small groups, and one-to-one) according to their individual needs, based on IEPs developed by the parents and the therapist, the special education teacher and aide. Teachers were certified in special education while aides were not. In addition, certified language and motor therapists provided individualized language and motor instruction to the children. These therapists also assisted teachers and paraprofessional aides with implementation of activities. The teachers' primary contact with parents about their child's progress was when the parents brought or picked the child up from school.

Expanded intervention (center-based plus parent involvement). Children in this treatment group attended the same center-based program discussed above. The children in both groups were scattered among the classrooms at the center. In addition, the parents participated in an education program based on the Parents Involved in Education (PIE) instruction package which had a parent-as-therapist focus but also included information and support components. This type of parent involvement program was chosen because it was similar to the parent involvement programs most frequently described in the existing literature.

The parent involvement component for this study (PIE) was primarily structured with a parents-as-therapist focus, but sessions also contained information and support components. Specifically, the PIE curriculum consisted of the following topics: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chairs, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

PIE instructional sessions were taught by a social worker and the director of the intervention center. Average group size consisted of between 8 and 12 parents. Instruction sessions consisted of 15 ninety-minute sessions, held weekly during the daytime for a period of four months. In addition to the information provided, PIE instructional sessions offered an opportunity for parents to form support networks and discuss challenges associated with parenting a child with a handicap.

Treatment verification. A number of procedures were implemented to verify that the intervention program occurred as planned. Child attendance at the center-based program was recorded daily and sent to EIRI on a monthly basis. It can be seen in Table 13.5 that child attendance exceeded 65% for both the parent involvement and comparison groups, but that the attendance of the children in the center-based group was slightly higher.

Parent attendance data (at the instruction classes) was recorded weekly; these data were also sent to EIRI on a monthly basis. The parents, on the average,

Table 13.5
Comparison of Treatment Verification Variables for Center-Based and Parent Involvement Group at Posttest #1 for 1986 Parent Involvement Study

	Center-Based Program			Center-Based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p** Value	ES^
• Test of Parent Knowledge	14.0	5.4	28	18.0	5.5	28	.01	.74
• Child's school attendance (%)	68.8	24.8	28	65.6	25.5	27	.64	-.13
• Teacher rating of parent's:[$]								
Attendance	2.6	.81	26	2.8	.42	24	.00	.25
Support	2.2	.95	26	2.6	.50	24	.00	.42
Knowledge	2.3	.97	26	2.5	.59	24	.02	.21
• Parent ratings of educational services*								
Staff	3.4	.50	28	3.4	.58	27	.91	.00
Communication	3.3	.61	28	3.4	.64	27	.61	.16
Child's goals/activities	3.2	.57	28	3.3	.61	27	.61	.18
Opportunity to participate	3.3	.65	28	3.5	.51	27	.09	.31
Range of services	3.0	.67	28	3.2	.70	27	.23	.30
Program in general	3.2	.55	28	3.3	.67	27	.48	.18
Child's progress	3.3	.47	26	3.1	.57	23	.38	-.43
• Additional outside services received (hours)								
Speech Therapy: % received more than 1 hour per month	7		27	11.5		26	.62	.17
Physical/Occupational Therapy: % received more than 1 hour per month	10.7		28	10.7		28	1.00	.00
Daycare: % received less than 5 hours per week	100		28	100		28	1.00	.00
Preschool/Head Start: % received less than 5 hours per week	3.6		28	3.6		28	1.00	.00

NOTES:

[$] Data are based on teacher ratings of parents' attendance, support, and knowledge range (1-3). Higher scores indicate a better rating.

[*] Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

[^] $$ES = \frac{\text{Center-Based + PIE } x - \text{Center-Based } x}{\text{Center-Based SD}}$$

attended nine of the fifteen sessions; one parent attended all fifteen sessions and one parent attended none. A standard deviation of 4.3 also indicates a wide variation in attendance.

A description of quality of parent involvement was also gathered annually from the intervener who worked most closely with the child's mother. The data obtained was the intervener's perception (low[1], average[2], high[3]) of how a parent rated on attendance, knowledge, and support. While the mean ratings for these variables tended to be high (2.62 for attendance, 2.40 for knowledge, and 2.42 for support), nearly half the sample ranked as low or average on one or more of these categories, indicating that interveners were discriminating in the ratings they applied. Both parent attendance and intervener ratings of the parents are typical of the situations experienced by many early intervention professionals who work with parents (Lochman & Brown, 1980).

The parents in the instruction group learned the material that was presented to them. At Posttests #1 and #2, all the parents took the PIE Knowledge Test. The items assessed the knowledge of the information learned in the PIE instructional sessions. It can be seen in Tables 13.5 and 13.6 that the test of parent knowledge scores were significantly higher for the parent involvement group at first and second posttest time (Posttest #1 $\underline{p}$ = .01, and Posttest #2 p = .03). This information indicates that parents in the parent instruction group retained the information taught them in the parent instruction sessions.

At both Posttests #1 and #2, the parents rated the educational services at the intervention center on a 4-point Likert-type scale. The mean scores for both groups at both posttests are 3.0 or above indicating that the parents were pleased with the educational services offered. Although the parents in the Center-based + PIE group rated the services higher than did the center-based only at Posttest #1 soon after the instructional sessions, the ratings were not significantly higher. At Posttest #2, the two groups rated the educational services similarly.

Table 13.6

Comparisons of Treatment Verification Variables for Center-Based and Parent Involvement Groups at Posttest #2 in the 1986 Utah Parent Involvement Study

	Center-Based Program			Center-Based + PIE			p** Value	ES^
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		
• Test of parent knowledge	15.0	5.9	20	19.1	4.8	17	.03	.69
• Parent ratings of educational services*								
Staff	3.5	.61	19	3.5	68	21	81	.00
Communication	3.7	.56	19	3.4	.75	20	.08	-.54
Child's goals/activities	3.5	.51	19	3.4	.51	21	.78	-.20
Opportunity to participate	3.6	.61	19	3.7	.48	21	61	.16
Range of services	3.0	.67	19	3.2	.81	21	.43	.30
Program in general	3.5	.51	19	3.4	.87	21	.84	-.20
Child's progress	3.5	,51	20	3.5	84	19	.86	.00

NOTES: * Data are based on Parent Satisfaction Questionnaire Scores (range 1-4). Higher scores indicate better ratings.

^ $\dfrac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$

During the initial year of the project, the site visit was conducted to make sure that the interventions were occurring as planned. The results of that site visit (a detailed report of which is available from the institute) found that all the children participated in essentially the same center-based program, with the major difference being that the parents of the children in the parent involvement group received the parent instruction and the parents of the children in the other group did not.

Cost of alternative programs. It is important to determine the cost of adding any type of a parent involvement component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish a parent program might be better spent elsewhere. Haskins and Adams (1982) point out that there is a great need for cost analysis in the area of parent education to provide evidence that such programs will justify their costs by increasing the productivity of parents, their children, or both, and/or reducing the necessity for larger investments in treatment programs at some later date. This study has addressed these issues in part, and will provide more conclusive answers as it follows these children through their school years.

The cost of the basic center-based program and the center-based plus PIE program as described above was determined using the ingredients approach advocated by Levin (1983). Costs are based on actual expenditures for direct service and administrative personnel, occupancy, equipment, transportation, materials and supplies, miscellaneous, and contributed resources. The cost per child was determined by dividing total resource cost in each category by the number of children receiving services in each program. On Table 13.7 all costs were adjusted for inflation to 1990 dollars. In addition, at the bottom of the table, the figures are discounted at 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Direct service and administrative costs included salaries plus benefits for each staff member according to the percentage of FTE allocated to each program. Occupancy charges included the annual rent for the two facilities in which the program was housed, and all utilities, insurance, and maintenance costs. Equipment costs were based on insurance estimates of the market replacement value of all equipment owned by the center, annualized to account for interest and depreciation. In addition, the cost of rental and maintenance of other equipment not owned by the center was determined. Transportation costs were paid by the center for staff home visits, workshop attendance, and errands as well as to subsidize the cost of bringing low-income children into the center. Transportation costs for all other children was assumed by their parents and is estimated under "contributed resources." The cost for materials and supplies and miscellaneous included the annual expense to the program for all consumable items and miscellaneous expenses incurred by each program.

Table 13.7

Cost Per Child for the 1986 Utah Parent Involvement Study (1990 Dollars)

Resources	Center-Based Program (n = 174)	Center-Based + PIE (n = 29)
Undiscounted		
Agency Resources		
Direct Service	$3,153	$3,334
Administration	608	640
Occupancy	694	694
Equipment	89	89
Transportation		
Children	10	10
Staff	7	7
Materials/Supplies	51	58
Miscellaneous	30	30
SUBTOTAL	**$4,642**[*]	**$4,862**[*]
Contributed Resources		
Volunteer time	25	25
Parent time	416	1,208
Parent Transportation	1,306	1,383
Miscellaneous	2	2
Subtotal	**$1,749**	**$2,618**
Total	***$6,391***	***$7,480***
Discounted (3%)		
Agency Resources	$5,071	$5,312
Total Resources	**$6,984**[*]	**$8,171**[*]
Discounted (5%)		
Agency Resources	$5,373	$5,627
Total Resources	**$7,398**[*]	**$8,657**[*]

[*] *Totals may not add up due to rounding errors.*

Contributed resources included the value of volunteer and parent time. Community members contributed 426 hours during the year to the program. Each parent in the PIE group spent approximately 13 hours in instructional sessions; assuming that parents followed PIE curriculum requirements, 67 hours working at home with their child. In addition, parents in both groups provided transportation for their children. The cost of child transportation was estimated based on information derived from parents via telephone interview. All volunteer time in the program was assigned the opportunity cost of $9 per hour. Finally, contributed miscellaneous resources included the market value of a computer donated to the program. Thus, the PIE program added approximately $1,000 to the cost of the basic center-based program.

Table 13.7 presents results which demonstrate that the addition of this type of parent involvement is fairly inexpensive. On the average, the addition of parent instruction to the center-based program only costs about $200 more per child in direct costs to the center. This is mostly due to increased personnel costs, although a small amount goes to supplies. However, when the value of contributed resources is added in, this difference is approximately $1,000, reflecting the addition of the parents' time. Although the addition of this type of a parent involvement program (e.g., PIE) is fairly inexpensive in actual dollars for an already-established center-based program, there is a substantial cost to participating parent in terms of their time. The question of the relative effectiveness of the parent involvement will be addressed in the results section.

Data Collection

Data collection procedures involved the recruitment, training, and monitoring of diagnosticians, and administration of measures at pretest and posttests. The measures used to obtain data on the children and their families and the tests at which they were used are listed in Table 13.8. Descriptions of the measures are presented in Table 13.9.

Recruitment, training, and monitoring of diagnosticians. With the exception of one BDI tester, this project used the same diagnosticians for pretest, Posttest #1, and Posttest #2. All of the diagnosticians had Master's degrees and extensive experience assessing infants and children with disabilities. In addition, two of

Table 13.8

Schedule of Administration and Test Administration for Utah 1986 Parent Involvement Study

	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X	X	X
Developmental SPECS					X
Minnesota Child Development Inventory		X			
Child Health		X			X
FAMILY MEASURES					
Parent Stress Index	X	X	X	X	X
Family Support Scale'	X	X	X	X	X
Family Resource Scale	X	X	X	X	X
Family Inventory of Life Events and Changes'	X	X	X		
Family Adaptation and Cohesion Scale	X	X	X	X	X
CES-D Depression Scale		X			
Child Improvement Questionnaire-Revised		X	X		
Peabody Picture Vocabulary Test	X*				
Parent-Child Interaction		X	X		X
Public School Teacher Evaluation			X		X

* Given at Posttest #1, but actually a part of the pretest.

Table 13.9

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses Personal/Social, Adaptive, Motor, Communication, and Cognitive Skills, and provides a total score.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: Communication, Sensorimotor, Physical, Self-Regulation, Cognition, and Self-Social.
Minnesota Child Development Inventory (MCDI) (Ireton & Thwing, 1974)	Assesses mother's perception of child development in eight areas: General Development, Gross Motor, Fine Motor, Expressive Language, Comprehension-Conceptual, Situation Comprehension, Self Help, and Personal-Social
Child Health (E.I.R.I.)	Assesses the parents evaluation of the child's health during the past year, including general health, illnesses, hospitalization, etc.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors and parent factors.
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Martial, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
CES-D Depression Scale (Radloff, 1977)	This scale is a short self-report test designed to measure depression-symptomatology on the general population.
Child Improvement Questionnaire--Revised (Devellis, Revicki, & Bristol, 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.

(continued)

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Table 13.9 (continued)

Description of Tests Administered for Utah 1986 Parent Involvement Study

MEASURES	DESCRIPTION
Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1981)	Measure the vocabulary of the mother. The score correlates highly with the mother's IQ.
Test of Parent Knowledge (E.I.R.I.)	Assesses parent's knowledge of PIE curriculum. Includes 30 multiple-choice questions.
Parent/Child Interaction (E.I.R.I.)	15 to 20 minute videotape of parent-child interaction following a set protocol devised by EIRI.

the three testers were enrolled in special education doctoral programs. All were trained through a lengthy process which involved observations of videotapes, a two-day training seminar, and required certification after administering at least three Battelles. At Posttest #3 and #4, new testers were trained. All were graduate students or professionals in special education or language therapy and were experienced testers. All had worked extensively with children. Although these diagnosticians were aware that research was being conducted, they were "blind" to the specific details, hypotheses, and group membership of participants in the study. Shadow scoring was conducted on 10% of BDI administrations. Average reliability scores always exceeded 90%.

Pretest. Pretesting took place in late October and early November of 1986. Parents of each child participating in the study completed an informed consent form and were interviewed concerning demographic information. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI), a measure of the child's developmental level. The BDI measures 5 areas of development which include personal social, adaptive behavior, motor, communication, and cognitive development. These scores are then summed to a total development score. The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the center. In a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed the following family measures: the Parenting Stress Index (which measures stress and coping behavior in the parent-child system), Family Support Scale (assesses the availability and helpfulness of different sources of support to families), Family Resource Scale (measures the extent to which different types of resources are adequate in households with young children), Family Inventory of Life Events and Changes (assesses life events and changes experienced by a family unit), and the Family Adaptability and Cohesion Scales (assesses perceived and ideal levels of family functioning). Information pertaining to the reliability and validity of these measures may be found in the first annual report (White & Casto, 1985). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttest #1. Initial posttesting occurred at the end of the school year during the last two weeks of May and the first week of June 1987, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery consisted of the same battery of tests and surveys as the pretest battery as well as some additional measures. For mothers, the additional tests and surveys included the CES-D Depression Scale (measures depression), a survey of child health, a Child Improvement-Questionnaire, Revised (assesses parental beliefs about the factors controlling the improvement of their child with handicaps), a test of knowledge regarding PIE curriculum, a satisfaction with educational services questionnaire, and the Peabody Picture Vocabulary Test (a measure of verbal intelligence). (Although the PPVT was given at Posttest #1, it was included with the pretest measures as another initial comparison measure, reasoning that attending PIE instruction would not affect the mothers' verbal intelligence.) Mothers also completed the Minnesota Child Development Inventory (MCDI), an additional measure of the child's developmental level as perceived by the mother. The posttest BDI and PPVT were administered by the trained diagnosticians.

Parents were paid a $40 incentive for completing the posttest battery. Additionally, mother/child interaction was videotaped for 16 minutes using a standardized protocol, and mothers were paid $10 for the videotaping session.

Posttest #2. A second posttest was conducted on both treatment groups in June, 1988. No monitoring of parental implementation of training principles took place between the first and second posttesting. Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out various family measures. In addition to family measures, parents in both treatment groups again completed the questionnaire assessing the parents' satisfaction with the preschool educational services and a test of knowledge regarding PIE curriculum. All parents were interviewed and were given the opportunity to comment on services received at the center. The parents who had also received the PIE instruction were asked to discuss their attitudes, knowledge, and satisfaction with the instructional program. They were also asked to discuss how their parenting techniques had changed as a result of the PIE, as well as how they handle stressful parenting. Parent-child interaction was again videotaped. After the completion of both the BDI and parental measures and interviews, parents were compensated $30 for their time.

For those few children (12) who were already in public school, special permission was obtained to contact the teachers of study participants. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for teachers to participate, two posters appropriate for classroom use were mailed with the questionnaire. This questionnaire had a 100% return rate.

Posttest #3. A third posttest was taken during the summer of 1989. Procedures for this posttest were similar to that of the second posttest. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, and a demographic survey. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Posttest #4. The procedures for the testing at Posttest #4 remained the same. The parents were contacted by letter in January, 1990, telling them of the schedule for testing and encouraging their participation. Permission to contact the school teachers, and the teacher's name and school of their children were also requested. Most of the testing took place at a special education center in the Salt Lake City area with some testing (primarily for those living out of state) being tested in their homes. Most of the testing was completed in April with some being done in May, June, and July.

Most of the measures used were the same as were used previously. The children's development was again assessed with the Battelle Developmental Inventory (BDI). Parents (in most cases, mothers) completed the core family measures, except the Family Inventory of Life Events, which was discontinued at Posttest #2. They also completed a demographic survey, a child health survey, a survey of their children's current educational program, and the test of knowledge regarding the PIE curriculum. Videotaping of parent-child interaction was also completed, using the standardized protocol that was used at Posttests #1 and #2. The length of the taping was increased to 20 minutes and toys appropriate for older children were included. The testing session lasted approximately 2½ hours and parents were paid $50 for the family's participation.

The public school teachers also completed measures of child development, using the Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1989). This measure asks the teacher to rate the child's development in 19 areas using Likert-type scales with the possible scores ranging from 1 to 5. On these scales a score of 5 signifies that the child's behavior is typical of the behavior most of the children of the same age, and a score of 1 signifies severe problems or very atypical development in that area. From the 19 ratings, six scores of different types of development are computed, including communication, sensorimotor, physical, self-regulation, cognition and self/social. The teachers also completed a questionnaire describing the children's present educational program and evaluating the parents' participation in the children's education. With the questionnaires, teachers were again sent classroom posters to thank them for their participation.

Results and Discussion

The primary question that these analyses sought to answer is what are the immediate and long-term effects of parents as therapist instruction on the young child with disabilities and on the family system? Second, is the magnitude of the effect associated with the degree of parental participation?

Comparability of Groups at Pretest

As was noted in the section on demographic characteristics, the two groups were very comparable (refer back to Table 13.1); there were no statistically significant differences between the groups on any of the variables (at $p < .05$).

The two groups were also comparable on the pretest measures. As can be seen in Table 13.10, there were no statistically significant differences on child development or family measures. P-values range from .97 to .11. The data in Table 13.10 indicate that the children, with an average total developmental quotient (developmental age ÷ chronological age x 100) of 58, were moderately retarded. The parents were experiencing significant child-related stress (measured by the PSI) with average child-related stress ranking at the 88th percentile (compared to PSI norms). The parents evaluated their resources (FRS scale) a little lower than average and their support (FSS scale) a little higher than average when compared to all the parents (over 900) in the EIRI Longitudinal Data Set. The parents also felt they had experienced a fair number of disrupting events. (Life events are measured by the FILE for which national norms are available; a low percentile indicates more disruption and stress.)

Selection of Covariates

The majority of analyses presented in this section are based on analysis of covariance procedures completed using SPSS-PC. Treatment group served as the independent variable, and dependent variables were scores obtained from the assessment instruments described earlier. (Analyses other than analyses of covariance are described as such in the text and/or table.) Even though subjects were randomly assigned to groups, analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one

Table 13.10

Comparison on Pretest Measures of Center-Based and Parent Involvement Groups in the 1986 Utah Parent Involvement Study

	Center-Based Program				Center-Based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES[^]
• **Battelle Developmental Inventory (BDI)**[*]										
DQs for:										
Personal Social	62.6	23.3		28	63.4	20.4		28	.90	.03
Adaptive Behavior	57.9	17.8		28	62.6	17.0		28	.31	.26
Motor	48.9	21.2		28	57.4	24.7		28	.17	.40
Communication	51.5	19.8		28	55.0	19.5		28	.50	.18
Cognitive	55.9	21.9		28	58.6	20.3		28	.64	.12
TOTAL	55.9	16.7		28	59.7	16.3		28	.38	.23
• **Parenting Stress Index**[♦] **(PSI) Percentile Rank**										
Child Related (range 47 to 235)	122.7	23.5	90	28	117.3	17.7	86	27	.34	.23
Other Related (range 54 to 270)	131.7	30.5	70	28	137.6	20.1	76	27	.40	-.19
TOTAL (range 101 to 505)	254.4	48.7	83	28	254.9	34.2	83	27	.97	-.01
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[+]										
Adaptability (range 0 to 24)	5.0	2.9		28	4.6	2.7		27	.58	.14
Cohesion (range 0 to 30)	5.5	6.2		28	3.7	2.2		27	.15	.29
TOTAL (range 9 to 54)	8.2	5.8		28	6.3	2.6		27	.11	.33
• **Family Resource Scale (FRS)**[$]	114.5	18.2	42	28	112.5	18.3	40	26	.70	-.11
• **Family Support Scale (FSS)**[$]	28.5	11.4	52	26	30.0	9.7	59	25	.62	.13
• **Family Index of Life Events**[♦] **(FILE)**	11.4	6.8	31	28	11.8	6.1	30	26	.82	-.06

---

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[+] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[$] Analyses for the FSS and FRS are based on raw scores indicating number of supports on resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with handicapped children).

[♦] Analysis for PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, high percentiles on the FILE represent fewer stressful events.

[^]

$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-Based Adj.}\bar{x}}{\text{Center-Based SD}}$$

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degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis.

All pretests and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables could be used to maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there were the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical $\underline{p}$ value for assuming statistical significance was set at .10.

Measures of Child Functioning

Posttest group comparisons. The groups were found to be basically comparable on the Battelle Developmental Inventory (BDI) across all tests (see Table 13.11). At pretest, the center-based + PIE group scored a little higher than did the center-based group and this advantage generally was evident across all posttests, with the scores of the two groups ending in the same relative position as they started. The center-based + PIE group maintained an advantage across posttests even with controlling for the pretest BDI differences, and at Posttest #2, the total BDI score of the center-based + PIE group was statistically significantly higher ($\underline{p} = .07$) than center-based group. In fact, out of 20 subscale scores, the children in the center-based + PIE group scored better on 17 scores than did the children in the center-based group. However, the average ES across measures of child's developmental functioning was only .11 at Posttest #1, .21 at Posttest #2, .16 at Posttest #3, and .14 at Posttest #4. Children in the center-based group scored the same as those in the center-based + PIE group on motor development at Posttest #3 and higher on motor development and communication at Posttest #1).

The developmental domains in which the children in center-based + PIE group showed the most consistent advantages were the cognitive and personal social domains.

Table 13.11

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #1 in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
POSTTEST #1												
● **Age in months at Posttest**[@]	--		(10.5)	50.0	28		(10.6)	48.6	28	.24	.62	-.13
● **Battelle Developmental Inventory (BDI) DQs for:**[•]												
Personal-Social	1,5	57.9	(24.7)	58.5	28	66.6	(21.1)	65.9	28	3.67	.06	.30
Adaptive Behavior	2	55.9	(22.5)	58.1	28	62.2	(18.7)	59.9	28	.29	.60	.08
Motor	2,3	51.9	(24.1)	56.4	28	59.9	(28.6)	55.4	28	.11	.74	-.04
Communication	1,4,5	54.2	(24.6)	55.9	28	56.5	(23.7)	54.8	28	.16	.69	-.04
Cognitive	2,4,5	54.5	(22.4)	56.5	28	63.7	(24.9)	61.7	28	2.46	.12	.23
Total	6		(20.1)	55.8	28		(18.4)	59.2	28	2.38	.13	.17
● **Child Health Rating**[@]	--		(.7)	1.9	28		(.7)	1.9	27	.17	.68	-.12
● **MCDI**[$]												
General Development	6	28.6	(9.5)	29.8	28	30.2	(8.9)	29.0	27	.08	.78	-.08
Gross Motor	3	23.1	(9.2)	24.8	28	25.8	(9.7)	24.1	27	1.45	.23	-.08
Fine Motor	2, 3	31.5	(13.2)	33.2	28	34.5	(8.9)	32.7	27	.64	.54	-.04
Expressive Language	4	27.8	(10.2)	28.8	28	28.4	(10.1)	27.4	27	.49	.49	-.14
Comprehension Conceptual	5	30.9	(10.5)	31.9	28	34.1	(13.8)	33.1	27	.12	.74	.11
Situation Conceptual	6	31.0	(14.3)	32.4	28	31.7	(13.4)	30.3	27	.69	.41	-.15
Self-Help	2	57.9	(17.8)	31.6	28	65.0	(12.0)	31.5	27	.00	.96	-.01
Personal-Social	1	25.8	(7.0)	26.1	28	28.5	(9.4)	28.1	27	.61	.44	.29
POSTTEST #2												
● **Age in months at Posttest**[#][@]	--		(11.9)	61.4	20		(11.6)	60.6	20	.05	.83	-.07
● **Battelle Developmental Inventory (BDI) DQs for:**[•]												
Personal-Social	4	54.9	(19.5)	55.1	20	61.9	(11.8)	61.7	20	3.70	.06	.34
Adaptive Behavior	2, 3	56.3	(17.8)	57.9	20	61.6	(12.1)	60.1	20	.34	.56	.12
Motor	2, 3	53.2	(18.6)	57.8	20	64.6	(23.1)	59.9	20	.39	.54	.11
Communication	4	51.1	(25.5)'	53.3	20	56.9	(19.4)	54.8	20	.12	.74	.06
Cognitive	4, 5	55.1	(21.7)	57.0	20	66.6	(21.3)	64.7	20	3.03	.09	.35
Total	6	53.4	(16.7)	55.1	20	61.5	(14.2)	59.7	20	3.62	.07	.28
● **Child Health Rating**[@]	--		(.6)	1.9	19		(.6)	2.0	21	.10	.76	.17

(continued)

[#] Covariance adjusted means

[•] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

[&] Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

[^]

$$ES = \frac{\text{Center-Based + PIF Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[♦] Each of the SPECS scores include a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

[$] ANCOVA analyses were done using the adjusted raw scores for the MCDI. Age equivalent scores have been used for the means and adjusted means in the table for easier understanding.

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Table 13.11 (continued)

Comparison of Posttest Measures of Child Functioning for Subjects in Center-Based and Parent Involvement Groups at Posttest #1 in the 1986 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	ANCOVA F	p Value	ES^
POSTTEST #3												
● **Age in months at Posttest #3**@	--		(9.6)	74.1	26		(11.2)	72.6	25	.25	.62	-.16
● **Battelle Developmental Inventory (BDI) DQs for:***												
Personal-Social	1,5	52.5	(21.7)	54.6	26	63.1	(18.0)	61.0	25	2.38	.13	.29
Adaptive Behavior	2	53.1	(21.6)	57.6	26	64.1	(18.3)	59.6	25	.22	.64	.09
Motor	2, 3	45.3	(20.7)	51.5	26	57.7	(24.6)	51.5	25	.00	1.00	.00
Communication	2, 4, 5	46.5	(21.1)	49.9	26	54.2	(20.5)	50.7	25	.04	.83	.04
Cognitive	2, 4, 5	53.1	(17.7)	51.5	26	59.3	(16.6)	57.7	25	2.18	.15	.35
Total	6	48.3	(16.9)	52.3	26	59.1	(17.4)	55.0	25	.77	.39	.16
POSTTEST #4												
● **Child Age at Posttest**@	--		(10.9)	84.3	28		(11.6)	83.0	24	.19	.67	-.12
● **Battelle Developmental Inventory (BDI) DQs for:***												
Personal-Social	6	58.5	(22.5)	61.7	28	72.8	(23.4)	69.6	24	2.44	.13	.35
Adaptive Behavior	6	55.0	(25.6)	58.4	28	66.3	(20.3)	62.8	24	.82	.37	.17
Motor	3	46.6	(22.2)	51.6	28	59.0	(25.6)	54.0	24	.44	.51	.11
Communication	4	48.1	(21.8)	51.5	28	58.4	(22.6)	55.0	24	.85	.36	.16
Cognitive	5	54.9	(24.0)	57.9	27	65.9	(21.8)	63.8	24	2.05	.16	.25
Total	6	51.8	(20.2)	55.3	28	63.4	(19.1)	59.9	24	1.90	.17	.23
● **Teacher's Developmental♦ SPECS**												
Communication	6	6.8	(1.7)	7.0	25	6.4	(1.9)	6.2	23	3.09	.09	-.47
Sensorimotor	6	14.0	(3.7)	14.4	25	14.8	(3.0)	14.4	23	.00	.97	.00
Physical	6	11.6	(1.7)	11.8	25	12.2	(1.7)	12.1	23	.53	.47	.18
Self-Regulation	6	13.8	(3.6)	14.1	25	15.9	(3.3)	15.6	23	2.60	.11	.42
Cognition	6	5.6	(2.3)	5.8	25	6.2	(2.3)	6.0	23	.06	.81	.09
Self/Social	6	12.7	(3.7)	13.1	25	14.3	(3.2)	13.9	23	.87	.36	.22
Child Health Rating@	--		(.5)	2.0	28		(.6)	2.1	24	.28	.60	.20

Covariance adjusted means

* For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

@ Results computed among t-tests. Means are not adjusted. T-test scores (not ANCOVA F) are given.

& Covariates: 1 = BDI Personal-Social Pretest; 2 = BDI Adaptive Behavior Pretest; 3 = BDI Motor Pretest; 4 = BDI Communication Pretest; 5 = BDI Cognitive Pretest; 6 = BDI Total Pretest.

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

♦ Each of the SPECS scores include a different number of items, each of which are ranked by the teacher on a Likert-type scale of 1 to 5. A score of 5 represents development in that area that is typical of peers and a score of 1 represents development that is atypical or problematic. Therefore, the optimal developmental score for communication is 10; sensorimotor, 20; physical, 15; self-regulation, 20; cognition, 10; self-social, 20.

$ ANCOVA analyses were done using the adjusted raw scores for the MCDI. Age equivalent scores have been used for the means and adjusted means in the table for easier understanding.

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In these domains, they scored statistically significantly higher than the children in the center-based group at Posttest #2 (personal social p = .06, cognitive p = .09) and in the personal social domain at Posttest #2 (p = .06).

The Minnesota Child Development Inventory (MCDI) describes the mother's evaluation of her child's development. The analyses at Posttest #1 showed no significant differences between the groups.

The Developmental SPECS (Bagnato & Neisworth, 1989), administered at Posttest #4, provides the teacher's evaluation of the child's development in six areas, communication, sensorimotor, physical, self-regulation, cognition, and self/social. The correlations between the BDI total development quotient and the six scales of SPECS ranged from .34 to .60. Therefore, the pretest total developmental quotient was used as a covariate for all six analyses. The children whose parents attended PIE did better than the children whose parents did not on four of the scales, but the only difference that was statistically significant was for the communication subscale (p = .09).

At Posttests #1, #2, and #4, parents rated their children's health from 1 to 3 with a rating of 2 signifying that their children's health was similar to their peers and a rating of 3 being better and 1 being poorer. The children's general health remained fairly constant across posttests with the ratings staying close to a "2" for both groups.

Parent attendance: High and no attendance comparisons. Group comparisons (center-based only vs. center-based + PIE) may not provide an adequate test of the effectiveness of this type of parent involvement program because data for families whose parents were invited, but did not attend regularly were included in the parent involvement group data. Attendance at the instructional sessions varied a great deal with parents from one family not attending any of the 15 sessions, and parents from one family attending all 15. On the average, the parents attended 9 of the 15 sessions. Thirteen parents attended 11 or more sessions (73%), 6 parents attended 7 to 10 sessions (47%), and 9 parents attended 6 sessions or less (40%) . Analyses were performed comparing the Battelle scores of the children whose parents attended most of the instructional sessions (11 or more) with those whose parents were in the center-based group and were not invited to the PIE sessions (28) to provide a test of the question of whether attendance at the PIE instruction affected subsequent child development.

To compare group differences between the high attending parent group and the center-based group, preliminary analyses were performed to identify covariates. The covariates, usually the same scale taken at pretest, are identified in Table 13.12. The children's whose parents were high attenders scored statistically significantly better than did the children in the center-based group on the personal/social scale at Posttests #1 and #3 and on the total scale at Posttest #2 (see Table 13.12). At Posttest #4, the children of the high attenders still had higher scores on the BDI, but none of the differences were statistically significant. Average effect size across all subscales of the BDI are .20, .31, .35, and .24 for Posttest #1, #2, #3, and #4, respectively. These data suggest that there may be some positive effects attributable to this type of parent involvement, but that the strength of the effect waned with passing time.

Measures of Family Functioning

Results of the analysis of measures of family functioning for the four posttests are shown in Table 13.13. The groups generally appear similar across posttests on measures of stress, resources, social support, and family functioning. Both groups seem to be experiencing fairly high stress as measured by the Parenting Stress Index across testing. The families in both groups consistently experienced more child-related stress than parent-related stress with the percentiles for both groups generally being 85 or higher.

Table 13.12

Comparison of Posttest Measures of Child Functioning for Children of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

		Center-based only				Attended 11 or more PIE Sessions						
Variable	Covariates[&]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES
POSTTEST #1												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	0,2	57.9	(24.7)	60.1	28	72.8	(10.4)	70.6	13	5.09	.03	.43
Adaptive Behavior	0	55.9	(22.5)	59.0	28	66.9	(17.7)	63.7	13	1.16	.29	.21
Motor	0	48.9	(24.1)	56.0	28	56.9	(24.2)	55.6	13	.01	.91	-.02
Communication	0	54.2	(24.6)	59.4	28	63.5	(22.9)	58.3	13	.07	.79	-.05
Cognitive	0	54.5	(22.4)	56.6	28	68.1	(20.7)	66.0	13	5.14	.03	.42
Total	0	53.8	(20.1)	57.5	28	65.7	(13.7)	62.0	13	2.45	.13	.22
POSTTEST #2												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	1,3	54.9	(19.5)	56.6	20	67.1	(8.9)	63.0	10	1.99	.15	.33
Adaptive Behavior	0	56.3	(17.8)	57.4	20	64.2	(13.2)	63.1	10	1.50	.23	.32
Motor	0	53.2	(18.6)	56.6	20	63.5	(20.6)	60.1	10	.61	.44	.19
Communication	0	51.1	(25.5)	55.4	20	61.4	(17.2)	57.2	10	.10	.75	.07
Cognitive	0	55.1	(21.7)	56.3	20	69.3	(18.0)	68.1	10	5.59	.03	.54
Total	0	53.4	(16.7)	55.2	20	64.3	(12.0)	62.0	10	2.87	.07	.41
POSTTEST #3												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	0	52.5	(21.7)	54.5	26	68.7	(19.5)	66.7	11	5.11	.03	.56
Adaptive Behavior	0	53.1	(21.6)	56.9	26	65.2	(15.9)	61.4	11	.92	.34	.21
Motor	0	45.3	(20.7)	49.9	26	56.6	(24.1)	52.1	11	.32	.58	.11
Communication	0,2	46.5	(21.1)	50.1	26	58.9	(17.6)	55.2	11	1.42	.24	.24
Cognitive	0	48.2	(17.8)	50.0	26	63.4	(20.4)	61.6	11	7.24	.01	.65
Total	0	48.3	(16.9)	52.0	26	61.2	(16.1)	57.5	11	2.40	.13	.33
POSTTEST #4												
Battelle Developmental Inventory (BDI) DQs for:												
Personal-Social	0	58.5	(22.5)	60.7	28	70.9	(22.0)	68.6	12	2.51	.12	.35
Adaptive Behavior	0	54.9	(25.5)	57.9	28	66.4	(19.0)	63.4	12	.84	.36	.21
Motor	0	46.6	(22.2)	50.1	28	57.7	(23.3)	54.2	12	.81	.37	.18
Communication	0	48.1	(21.8)	53.2	28	62.8	(21.9)	57.7	12	1.03	.32	.21
Cognitive	0	54.9	(23.7)	56.7	28	66.0	(17.5)	64.2	12	2.66	.11	.32
Total	0	51.8	(20.2)	56.9	28	63.5	(17.3)	60.8	12	.46	.64	.19

[#] Covariance adjusted means

[&] Covariates: 0 = Same Scale Taken at Pretest; 1 = DQ Total at pretest; 2 = DQ cognitive at pretest; 3 = DQ Communication at pretest

[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[-] $$ES = \frac{\text{Center-based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-based SD}}$$

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Table 13.13

Comparison of Posttest Measures of Family Functioning of Center-Based and Parent Instruction Groups in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates$	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES~
POSTTEST #1														
● **Parent Stress Index**♦														
Child Related Range (47 to 235)	0	121.9	(22.7)	120.5	89	28	121.0	(16.8)	122.4	90	27	.17	.68	-.08
Other Related Range (54 to 270)	0	134.8	(29.9)	137.0	75	28	138.4	(21.5)	136.1	74	27	.04	.85	.03
Total Range (101 to 505)	0	256.7	(48.4)	256.9	85	28	259.6	(36.4)	259.4	86	27	.10	.76	-.05
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**'														
Adaptability Range (0 to 24)	0	4.5	(2.9)	4.5		28	3.9	(3.2)	3.9		27	.63	.43	.21
Cohesion Range (0 to 30)	0,1	4.9	(4.5)	5.1		28	3.3	(2.9)	3.2		27	3.8	.06	.42
Total Range (0 to 54)	0	7.9	(4.5)	7.3		28	5.8	(3.3)	5.7		27	2.55	.12	.36
● **Family Resource Scale (FRS)**&	0	112.4	(23.6)	111.5	39	28	111.5	(19.7)	112.3	39	26	.04	.85	.03
● **Family Support Scale (FSS)**&	0	27.5	(10.4)	27.9	50	26	32.5	(10.7)	32.1	66	25	2.69	.11	.40
● **Family Index of Life**♦ **Events (FILE)**	0	10.7	(7.6)	10.8	34	28	12.0	(6.9)	11.9	29	26	.51	.48	-.14
● **Child Improvement Questionnaire-Revised**@														
Professional			(3.6)	19.0		28		(3.6)	19.6		28	.31	.58	.17
Divine Intervention			(3.8)	11.3		28		(3.3)	10.5		28	.75	.39	-.21
Parent			(3.9)	24.1		28		(2.3)	24.6		28	.29	.59	.13
Child			(3.9)	21.5		28		(3.5)	20.0		28	2.18	.15	-.38
Change			(3.0)	9.2		28		(1.9)	9.8		28	.73	.40	.20
● **CES-D (depression)**♣*			(12.4)	36.4		28		(11.7)	33.4		28	.89	.35	-.24

* Results computed among t-tests. Means are not adjusted.

Covariance adjusted means.

$ Covariates: 0 = This same scale taken at pretest; 1 = FILE; 2 = Relationship of child with mother; 3 = number of siblings receiving special education services; 4 = education level of mother, 5 = education level of father, 6 = father's age; 7 = PSI total at pretest; 8 = FACES total at pretest.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

' Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

♦ Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

~

$$\text{ES} = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

@ Assesses parental perceptions of factors that affect child's developmental progress.

♣ Assesses parental depression.

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Table 13.13 Cont.

Comparison of Posttest Measures of Family Functioning of Center-Based and Parent Instruction Groups in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES[^]
POSTTEST #2														
● Parent Stress Index[♦]														
Child Related Range (47 to 235)	0	117.4	(19.9)	116.1	85	21	114.7	(16.2)	116.1	85	20	.00	1.00	.00
Other Related Range (54 to 270)	0	126.8	(26.3)	128.4	63	21	137.8	(18.4)	136.1	74	20	2.66	.11	-.29
Total Range (101 to 505)	0	244.2	(43.0)	244.3	75	21	252.5	(31.8)	252.4	81	20	1.15	.29	-.19
● Family Adaptation and Cohesion Evaluation Scales (FACES)[']														
Adaptability Range (0 to 24)	0	4.5	(3.2)	4.3		21	4.5	(2.9)	4.7		20	.19	.66	-.13
Cohesion Range (0 to 30)	0, 1	4.4	(3.8)	4.4		21	3.6	(2.6)	3.6		20	.59	.45	.21
Total Range (0 to 54)	0	7.0	(3.9)	6.7		21	6.2	(3.1)	6.5		20	.01	.90	.05
● Family Resource Scale (FRS)[&]	0	115.9	(22.7)	115.1	43	21	113.6	(19.6)	114.4	41	19	.02	.90	-.03
● Family Support Scale (FSS)[&]	0	29.7	(10.5)	30.2	57	19	31.9	(9.9)	31.5	66	19	.18	.68	.12
● Child Improvement Questionnaire-Revised[*][@]														
Professional	--		(5.2)	24.9		21		(4.6)	22.7		19	1.89	.18	-.42
Divine Intervention	--		(4.7)	14.2		21		(3.9)	11.4		19	4.19	.05	-.60
Parent	--		(4.8)	28.8		21		(4.3)	27.8		19	.40	.53	-.21
Child	--		(4.3)	23.9		21		(4.3)	23.6		19	.06	.81	-.07
Chance	--		(3.6)	12.2		21		(3.0)	10.8		19	1.60	.21	-.39

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[*] Results computed among t-tests. Means are not adjusted.

[#] Covariance adjusted means.

[$] Covariates: 0 = This same scale taken at pretest; 1 = FILE; 2 = Relationship of child with mother; 3 = number of siblings receiving special education services; 4 = education level of mother, 5 = education level of father, 6 = father's age; 7 = PSI total at pretest; 8 = FACES total at pretest.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

['] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[^] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

[@] Assesses parental perceptions of factors that affect child's developmental progress.

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Table 13.13 Cont.

Comparison of Posttest Measures of Family Functioning of Center-Based and Parent Instruction Groups in the 1986 Utah Parent Involvement Study

		Center-Based					Center-Based + PIE							
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	F	p Value	ES[~]
POSTTEST #3														
● **Parent Stress Index**[♦] Child Related Range (47 to 235)	0	119.3	(22.1)	118.0	87	26	116.6	(14.1)	117.9	87	23	.00	.98	.05
Other Related Range (54 to 270)	0	128.0	(27.0)	128.7	65	26	128.1	(16.0)	127.4	61	23	.06	.81	.05
Total Range (101 to 505)	0	247.3	(42.6)	246.8	77	26	244.7	(26.2)	245.2	76	23	.04	.85	.04
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[']														
Adaptability Range (0 to 24)	0	4.5	(2.7)	4.5		26	3.9	(1.9)	3.9		23	.77	.38	.22
Cohesion Range (0 to 30)	1	5.8	(5.7)	5.8		26	3.7	(3.9)	3.6		22	2.19	.15	.39
Total Range (0 to 54)	0	7.9	(5.6)	7.5		26	6.0	(3.4)	6.3		23	.97	.33	.21
● **Family Resource Scale (FRS)**[&]	0	117.5	(20.8)	117.5	50	26	118.0	(16.5)	118.0	50	22	.01	.92	.02
● **Family Support Scale (FSS)**[&]	0	30.9	(14.1)	31.2	63	24	26.6	(8.2)	26.3	46	22	2.42	.13	-.35
POSTTEST #4														
● **Parent Stress Index**[♦]														
Child Related Range (47 to 235)	0,2,3	118.0	(20.6)	118.0	87	28	112.8	(16.2)	112.8	79	23	1.25	.27	.25
Other Related Range (54 to 270)	2,3,7	127.3	(25.1)	129.5	65	28	133.4	(16.6)	131.2	68	23	.12	.73	-.07
Total Range (101 to 505)	0,2,3	245.3	(40.1)	248.4	78	28	246.2	(27.5)	243.2	74	23	.48	.49	.13
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[']														
Adaptability Range (0 to 24)	4,8	5.4	(3.2)	5.1		28	4.3	(3.0)	4.5		23	.51	.48	.19
Cohesion Range (0 to 30)	0	5.1	(3.6)	4.9		28	3.3	(2.6)	3.5		23	2.67	.11	.40
Total Range (0 to 54)	0,5	8.0	(3.7)	7.8		28	6.1	(2.8)	6.3		23	3.25	.08	.41
● **Family Resource Scale (FRS)**[&]	0	118.5	(17.9)	117.5	48	28	116.1	(18.5)	117.0	50	22	.02	.88	-.03
● **Family Support Scale (FSS)**[&]	0	26.8	(9.8)	26.9	48	26	27.1	(8.5)	27.0	48	22	.00	.99	.01

[•] Results computed among t-tests. Means are not adjusted.

[$] Covariates: 0 = This same scale taken at pretest; 1 = FILE; 2 = Relationship of child with mother; 3 = number of siblings receiving special education services; 4 = education level of mother, 5 = education level of father, 6 = father's age; 7 = PSI total at pretest; 8 = FACES total at pretest.

[&] Analyses for FSS and FRS are based on raw scores indicating number of supports or resources indicated by family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families of children with handicaps).

['] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[♦] Analysis for the PSI & FILE are based on raw scores. Lower scores represent less stress and are considered better. Both scales provide norms. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

[~] $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

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The resources available (as measured by the FRS) to families in both groups are comparable, with both groups reporting more resources at Posttest #4 than at Pretest. The information provided by parents concerning income supports this finding. The families earned an average of $4,000 more in 1990 than they did in 1986. The social support scores (measured by the FSS) fluctuate more than do the family resource scores. The parents who attended the PIE sessions reported slightly higher scores after their participation (at Posttest #1) and a year later (at Posttest #2), possibly indicating some effect from the support of the instructor and other parents. One item in the Family Support Scale out of 19 deals with support from other parents and two items deal with support from professional helpers and school. However, at neither Posttest #2 or #3 were the scores of the parents who attended the sessions significantly different than those of the parents who did not attend. Overall, for both the FRS and FSS measures these families' scores lie midway among the families in the EIRI **Longitudinal Studies**.

On the PSI, FRS, & FSS scales, the relative position of the two groups change from one posttest to another with neither group having a consistent advantage. However, on the measure of family functionings (FACES) the parents who participated in PIE consistently had better scores (but not statistically significantly better) scores across posttests on the total FACES score and the cohesion subscore than did the parents in the center-based group. The Family Adaptability and Cohesion Evaluation Scale-III (FACES III) provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. A lower cohesion score (closer to 0) represents a balance between extreme low cohesion (disengagement) and extreme high cohesion (enmeshment). Therefore, since the advantage is consistent across time, possibly the PIE instruction assisted the families by positively impacting the degree of cohesion within the family unit.

In sum, the families in the two groups seem to be handling their stresses, families, and lives equally well over time. The only possible advantage seen for the families of the parents who participated in PIE is more cohesion within the family unit. Analyses comparing the scores of the high-attending parents with the center-based parents on the family measures did not reveal any statistically significant differences between the groups.

Other Analyses

Parent-child interaction. Another way to investigate possible effects of the instructional program is to measure parent-child behaviors in free-play interaction sequence. Parent-child dyads were videotaped at Posttests #1, #2, and #4. These interaction tapings were approximately 20 minutes in length and followed a protocol. Toys and books were provided. Most of the time was spent in free play, followed by a cleaning up of toys, joint book reading, parent leaving for 45 seconds, returning and more free play. The videotapes were coded by two parent-child interaction rating scales (i.e. The Parent/Caregiver Involvement Scale [PCIS], Farran, Kasari, Comfort & Jay, 1986, and The Parental Behavior Rating Scale [PBRS], Mahoney, 1988). The codings were completed by coders under the direction of the respective authors.

The PCIS scale measures 11 parent or caregiver behaviors. These scales include: physical involvement, verbal involvement, responsiveness, play interaction, teaching behavior, control, directives, relationship among activities in which caregiver was involved, positive statements, negative statements/discipline, and goal setting. Each of these caregiver behaviors were rated separately for amount of behavior, quality of behavior, and appropriateness of behavior on 5-point Likert-type scales. The amount scores for the 11 variables were summed and averaged resulting in an amount score. Similarly, quality and appropriateness scores were computed. In comparing these cumulative variables for the two groups, Table 13.14 demonstrates that the parents in the two groups were rated similarly except for quality of behavior at Posttest #1. Child age, sex and BDI total development score at pretest were considered for covariates, but the correlations were so low, they were not used in the analyses.

Table 13.14

Comparison of Parental Behaviors as Coded by the PCIS (Farran) For Parents in the Center-Based and Parent Involvement Groups for Posttest #1 and #2

Variable		Center-Based			Center-Based + PIE			ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n			
POSTTEST #1										
Average Rating:	Amount	2.8	(.6)	26	2.7	(.4)	22	.47	.50	-.16
	Quality	3.7	(.7)	26	4.1	(.6)	22	5.12	.03	.57
	Appropriateness	3.9	(.6)	26	4.2	(.7)	22	2.47	.12	.50
POSTTEST #2										
Average Rating:	Amount	3.0	(.6)	19	3.0	(.6)	17	.05	.83	.00
	Quality	3.9	(.9)	19	4.2	(.6)	17	1.01	.32	.33
	Appropriateness	4.1	(.9)	19	4.2	(.8)	17	.59	.45	.11

[a] Involvement was rated (with a Likert-type scale, range 1-5) over 11 parent/caregiver behaviors (Physical Involvement, Verbal Involvement, Responsiveness to Child, Play Interaction, Teaching Behavior, Control Activities, Directiveness/Demands, Relationship Among Activities, Positive Statements/Regard, Negative Statements/Regard, Goal Setting). Average ratings were then computed for the amount, quality, and appropriateness of the parent/caregiver behaviors.

[b] Average for general impression ratings given above.

^ $$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

The PBRS (Mahoney) rates 12 parental behaviors including warmth, expressiveness, enjoyment, acceptance, sensitivity to child's interest, responsivity, effectiveness, directiveness, achievement orientation, pace, inventiveness, and verbal praise. Based on a principle axis factor analysis (using the SPSSPC) of these 12 variables for 462 observations of parent-child interaction from the EIRI studies, 3 factors were identified which together accounted for 61.8% of the variables. Factor 1, affective relationship with child, included expressiveness toward child, enjoyment of interacting with child and acceptance of child's behaviors. Factor 2, orientation to child's interests and behaviors, included sensitivity to child's interests, responsivity and effectiveness of parent to engage child in play interaction. Factor

3, performance orientation, included achievement orientation, pace of parent's behaviors and intensity and frequency of directives. Two variables, verbal praise and inventiveness, did not load high enough to be included in any factor. The three factors were compared for the two groups at Posttests #1, #2, and #4. Covariates were included in the analyses when their correlation with the outcome variables were high.

The parents in the center-based + PIE group were slightly more effective and more oriented to the child's interests than were the parents in the center-based group at Posttests #1, #2, and #4, but not statistically significantly so (see Table 13.15). The relative position of the two groups for the ratings on performance orientation changed over posttests and were also not statistically significantly different at any posttest.

Again, to investigate whether the PIE instruction affected parent behaviors, the behavior ratings of those parents who attended 11 or more of the PIE sessions were compared with the behavior ratings of the parents in the center-based only group as measured by the PCIS (Farran et al., 1986) rating scale. As can be seen in Table 13.16, at Posttest #1, soon after the sessions were completed, the parents who attended 11 or more sessions had statistically significantly higher scores than did the parents in the center-based only group on the average scores for quality and appropriateness of parenting behaviors. At Posttest #2, the quality and appropriateness scores were still higher for the high attending group, but the differences were not statistically significant. No differences were found between these two groups on the MBRS rating scale at any of the posttests.

In sum, the parent/child interaction findings are mixed. Over all the posttests, the rating system variables do not reflect differences in parent behaviors between the group. However, at Posttest #1, soon after the PIE involvement sessions were completed, the group comparison (center-based only vs. center-based + PIE) show

Table 13.15

Comparison of Parental Behaviors as Coded by the PBRS (Mahoney) for the Parents in the Center-Based and Parent Involvement Groups for Posttests #1, #2, and #4

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES^
POSTTEST #1												
Affective relationship with child		3.0	(.6)		26	3.2	(.5)		21	1.49	.23	.32
Child orientation (responsivity to child)	1,2	2.9	(.7)	3.1	26	3.1	(.7)	3.0	21	.00	.96	.27
Performance orientation toward child	0,1,2	3.0	(.8)	3.0	26	3.1	(.8)	3.2	21	.80	.38	.13
POSTTEST #2												
Affective relation with child		2.9	(.6)		19	3.2	(.7)		16	.95	.34	.48
Child orientation (responsivity to child	1,2	2.8	(.8)	2.8	19	3.2	(.6)	3.2	16	2.12	.16	.49
Performance orientation toward child	0,1,2	3.0	(.8)	2.9	19	2.8	(.8)	2.8	16	.18	.68	-.25
POSTTEST #4												
Affective relationship with child		3.0	(.5)		24	3.1	(.5)		23	.84	.37	.19
Child orientation (responsivity to child)	1,2	3.3	(.9)	3.3	24	3.4	(.6)	3.3	23	.00	.97	.11
Performance Orientation toward child	0,1,2	2.6	(.9)	2.5	24	2.5	(.7)	2.6	23	.00	.97	-.11

$ Covariates: 0 = Caper; 1 = Sex; 2 = DQT

^
$$ES = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

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Table 13.16

Comparison of Posttest Measures of Child Functioning for Children of Parents Who Attended 11 or More PIE Instruction Sessions, and Children of Parents in the Center-Based Only Group

Variable	Covariates&	Center-based only				Attended 11 or more PIE Sessions				ANCOVA F	p Value	ES^
		$\bar{x}$	(SD)	Adj.$\bar{x}$#	n	$\bar{x}$	(SD)	Adj.$\bar{x}$#	n			
POSTTEST #1												
Average Rating												
Amount		2.8	(.6)		26	2.6	(.5)		11	.37	.55	-.36
Quality		3.7	(.7)		26	4.3	(.6)		11	6.10	.02	.92
Appropriateness		3.9	(.6)		26	4.4	(.7)		11	5.70	.02	.83
Factors:												
Affective Relationship		3.0	(.6)		26	3.0	(.5)		11	.00	.97	.00
Child Orientation	0,1	2.9	(.7)	3.0	26	3.4	(.8)	3.3	11	1.05	.31	.68
Performance Orientation	0,1,2	3.0	(.8)	2.9	26	2.9	(.8)	3.0	11	.00	.96	-.13
POSTTEST #2												
Average Rating												
Amount		3.0	(.6)		19	2.9	(.8)		9	.17	.68	-.16
Quality		3.9	(.9)		19	4.3	(.7)		9	1.20	.29	.43
Appropriateness		4.1	(.9)		19	4.4	(.6)		9	1.32	.26	.33
Factors												
Affective Relationship		2.9	(.6)		19	3.0	(.7)		8	.06	.81	.16
Child Orientation	0,1	2.8	(.8)	2.8	19	3.1	(.7)	3.1	8	.45	.51	.37
Performance Orientation	0,1,2	3.0	(.8)	2.9	19	2.6	(.7)	2.7	8	.45	.51	-.50
POSTTEST #4												
Factors												
Affective Relationship		3.0	(.5)		24	3.1	(.6)		12	.33	.57	.19
Child Orientation	0,1	3.3	(.9)	3.3	24	3.2	(.6)	3.1	12	.47	.50	-.11
Performance Orientation	0,1,2	2.6	(.9)	2.5	24	2.4	(.8)	2.5	12	.04	.84	-.22

Covariance adjusted means

& Covariates: 0 = Sex; 1 = DQT at pretest; 2 = Child age at pretest

$$\hat{ES} = \frac{\text{Center-Based + PIE Adj.}\bar{x} - \text{Center-based Adj.}\bar{x}}{\text{Center-Based SD}}$$

that the center-based + PIE group scored statistically significantly higher in the quality of the parenting behaviors. This finding is strengthened when the comparison between the high attenders at PIE sessions and the center-based group is made. Again, at Posttest #1, high attenders were statistically significantly higher in both the quality and appropriateness of their parenting behavior. However, statistical significance of these differences did not remain at Posttest #2. Possibly the content of the PIE instruction helped the parents in their interaction with their children for a short period of time.

Parent satisfaction with services. Parents in both groups were satisfied with the services provided (refer back to Tables 13.5 and 13.6). With the ranges of responses (1-4, representing poor to excellent), the mean scores were all 3.0 or above. At Posttest #1, soon after the intervention was completed, there was a trend for the parents in the parent instruction group to be more satisfied with their opportunity to participate than the parents in the center-based group ($\underline{p}$ = .09). At the time of Posttest #2, there were no statistically significant differences between the two groups' satisfaction with services, with the exception of a trend for the comparison group to rate their ability to communicate with program staff slightly higher.

Interviews conducted with parents at the time of the second posttest revealed that the majority were satisfied with the center-based services they received. Only one parent of the 40 interviewed reported leaving the center's intervention program because of inadequate services. Several reported problems with transportation (6 parents) or scheduling of the child's classes (3 parents). The most frequently cited service mentioned as most helpful by these parents was speech therapy.

Parents who participated in the PIE program were asked specific questions about their classes. (Seventeen parents completed these questionnaires.) The majority (14) of these 17 parents found the center-based program more valuable than the PIE instruction. However, most reported less stress in their lives after the instruction (11) or no change in stress (2 parents). Fourteen of the 17 parents reported that they felt the PIE program positively influenced their interactions with their children, with these parents claiming greater objectivity and more effective use of reward and punishment. Fifteen of the 17 parents were satisfied with the parent-involvement package and the information provided. Of the two parents who did not report satisfaction, one seemed simply indifferent to the program and attributed some of her indifference to her poor attendance (which was due to scheduling conflicts). The other parent did not feel the information was useful and was, therefore, dissatisfied.

Parent knowledge of PIE curriculum. As was discussed in the treatment verification section, all the parents took a test based on the PIE curriculum at Posttest #1 soon after the 15 instruction classes were finished and a year later at Posttest #2. The center-based + PIE group answered the questions significantly better than the parents who didn't attend the classes (the center-based group) at both posttests (Posttest #1 $\underline{p} = .01$; Posttest #2 $\underline{p} = .03$). (See Tables 13.5 and 13.6). The test was also administered three years after the instruction was completed at Posttest #4. At this time, the scores of the PIE group were still higher than the center-based group (parent instruction $\bar{x} = 17.42$ and center-based $\bar{x} = 14.61$; $\underline{p} = .11$).

P.I.E. instructor effect. Because instructor effects have been previously noted in influencing parent involvement (Hoover-Dempsey, Bassler, & Brissie, 1987), an additional analysis was completed on the posttest data which compared the effect of parenting group instructor on outcome measures for the parenting group. (Two instructors taught the parent workshops; one had one class of 9 parents while the other had two classes which also consisted of 9 parents each.) Table 13.17 presents these results. No statistically significant effect due to instructors was evident on child or family functioning measures.

Intervener ratings. The rating of the parents by the child's preschool teacher at the time of first posttest would appear to have some predictive utility. Because most direct interveners feel confident that they can accurately identify parents who are motivated and engage in a high quality of involvement with the child's intervention program, it was thought that this data might be useful in predicting parental success in implementing the parent program. Table 13.18 shows the correlations between the child's total developmental scores at first posttest and the intervener

Table 13.17

Comparisons of Effect Due to Instructor at Posttest #1 in the 1986 Parent Involvement Study

	Instructor #1				Instructor #2				
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value
● CES-D (depression)	29.33	5.68		9	35.44	13.73		18	.22
● PSI--Total	245.89	32.38	77	9	259.89	44.27	86	18	.41
● PSI--Child	114.67	18.90	82	9	122.61	17.07	90	18	.28
● PSI--Other	131.22	14.26	68	9	137.28	28.75	75	18	.47
● FACES--Adapt	3.89	2.37		9	5.50	6.73		18	.37
● FACES--Cohesion	6.22	9.43		9	8.22	7.16		18	.54
● FACES--Total	10.11	8.77		9	13.72	11.63		18	.42
● Battelle Total (DQ)	56.45	14.3		9	66.02	14.5		18	.12

Table 13.18

Correlation Between Intervener Ratings of Parents and Children's Total Battelle Scores at Three Posttests in the 1986 Utah Parent Involvement Study

Teacher Rating	Posttest 1 (n = 50)	Posttest 2 (n = 38)	Posttest 3 (n = 42)
Parent Attendance	r = -.08 p = .60	r = .08 p = .63	r =-.07 p = .67
Parent Knowledge	r = .07 p = .61	r = .09 p = .59	r = .04 p = .80
Parent Support	r = .23 p = .12	r = .28 p = .09	r = .16 p = .28

ratings of the parents. It can be seen that intervener rating of parent attendance and knowledge is poorly correlated with children's Battelle scores. Intervener rating of parent support is most highly related to the child's developmental scores at all three posttests; but the correlations are still small.

Other analyses revealed that intervener rating of parent knowledge (r[23] = -.06, p = .393) and parent support (r[23] = .25, p = .123) were not significantly correlated with actual parent attendance. Not surprisingly, intervener rating of parent attendance and parent attendance at parent training sessions were significantly and positively related, r[23] = .47, p = .011. (Considering that intervener rating included factors beyond the parent training sessions, such as attendance at IEP meetings, this moderate correlation is as would be expected.) However, in this study, the predictive utility of intervener ratings are not confirmed.

Public school follow-up. Information allowing the investigation of the effect of parent instruction on later schooling was provided by teacher questionnaires at Posttests #2 and #4 (see Table 13.19). By the summer of 1990, at Posttest #4, the youngest child in the sample was over five years of age. At this time, with 50 of the children in some type of public school program (preschool to second grade), one in a private preschool program, and one in a home-based program. Table 13.20 shows that the group comparison of grade placement (as reported by the teacher) revealed that there were no statistical differences between the groups (Chi square sig = .14). However, the teachers provided grade information on only 33 of the questionnaires. Possibly when children of various levels are grouped together in self-contained classrooms, grade is not a meaningful marker. An excellent opportunity was, therefore, provided to evaluate the effect of the parent instruction on the child's subsequent education. Forty-eight teacher questionnaires and 52 parent follow-up questionnaires were completed.

The following information was provided. Four children (center-based = 1; center-based + PIE = 3) of the 47 for which data were available did not presently need special education services while forty-three (center-based = 24; center-based + PIE = 19) received these services. Teachers provided information concerning the percent of school time each student spent in regular classrooms, self-contained classrooms, resource rooms, and other types of classrooms. Typically, the children

Table 13.19

Public School Teacher Ratings of Children who had Participated in The 1986 Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates$	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES^
● Teacher rating of parent's:												
Attendance		4.2	(1.2)		22	5.3	(1.8)		21	5.62*	.02*	92
Support/Participation	0	15.1	(4.0)	14.9	21	17.9	(5.5)	18.1	19	4.91*	.03*	.80
Knowledge		13.6	(3.6)		20	18.6	(7.9)		19	6.38	.02	1.39
● Percent Children needing Special Education		96.0			25	86.4			22		.27	-.28
● Percent Time in regular classroom		26.3	(34.5)		26	37.3	(40.5)		21	1.00	.32	.32
● Percent Time in self-contained class		73.1	(34.6)		26	56.8	(46.3)		21	1.90	.18	-.45

$ Covariates: 0 = Total Income

* ANCOVA F, p value, and ES are computed on adjusted means when adjusted means were computed.

$$ES = \frac{\text{Center-Based + PIE } \bar{x} - \text{Center-Based } \bar{x}}{\text{Center-Based SD}}$$

The sign of ES only indicates direction of differences, no judgment is intended.

Table 13.20

Comparison of Grade Placement at Posttest #4 for the Children in the Center-Based and Parent Involvement Groups for the Utah Parent Involvement Study

Groups	Preschool	Kindergarten	1st	2nd	Mixed	Chi-Square	Sig.
Center-Based* (n = 18)	5	2	5	2	1		
Center-Based + PIE (n = 15)*	1	7	3	4	0	6.84	.14

* Only 33 teachers completed this item, 23 did not

in both groups spent more time in self-contained classrooms, but yet spent some time in regular classrooms, with the average percent for the entire sample being 68% of time in self-contained classrooms and 32% in regular classrooms. Only five children spent time in resource rooms and/or other types of classrooms. Eight children (center-based = 3; center-based + PIE = 5) spent 90% or more of their time in regular classrooms, while 23 (center-based = 14; center-based + PIE = 8) were in self-contained classes for 90% or more of their time. In comparing the groups, the children in the center-based + PIE group spent a greater percent of time in regular classrooms (39.2%) than did the children in the center-based group (26.3%), but the difference was not significant (p = .25). Conversely, the children in center-based group spent a greater percent of their time in self-contained classrooms (76%) than did the children in the center-based + PIE group (57.5%), but the difference again was not statistically significant (p = .14). Group differences for percent of time spent in resource rooms and in other types of classrooms were not significantly different.

Seventeen children (center-based = 9; center-based + PIE = 8) were receiving some type of therapy (e.g., speech therapy) as part of their regular educational program. Some of the children received more than one kind of therapy (see Table 13.21).

Teacher's rating of parents. At Posttests #2 and #4, teachers rated the parents' participation in the educational program from less than other parents (1) to more than other parents (3) on 15 items. The items were summed into three variables (parent attendance, parent knowledge, and parent support). At Posttest #2, the number of children in public school were few, and no differences were seen between the groups in parent attendance, knowledge, and support. However, at Posttest #4, the group comparison (see Table 13.19) showed that the parents who attended the PIE instruction were considered more knowledgeable about their children's education (p = .02, ES = 1.39), more supportive (p = .07, ES = .70), and attended more of the educational meetings (p = .02, ES = .92) than did the parents who did not participate in PIE.

The variables of mother and father's education and total income were considered as covariates and entered into the step-wise multiple regression procedures. Only total income was found to be significantly related to parents' support, so it was entered as a covariate in the analysis of covariance for this variable. These results indicate that possibly the participation in the instruction sessions "prepared" the parents to feel that they have responsibility and power to take part in their children's education.

Additional services follow-up. Outside of the school program, some of the families were providing other care, therapy, and programs for their children. Table 13.21 provides the reported data. Only slight differences were found between the groups. Thirteen families in the center + PIE group were providing additional therapy or educational programs for the children, while 11 families in the center-based group were. Also, slightly more children in the center-based + PIE group (6) participated in group activities for the disabled than did the children in the center-based group (4). Conversely, more of the children in the center-based group (8) spent time in day care than did children in the center-based + PIE group (4).

The parents also provided information concerning their own activities. Thirty-two parents (center-based = 18; center-based + PIE = 14) reported that they had not taken any classes in parenting in the last two years. Nineteen (center-based = 10; center-based + PIE = 9) reported they had. Few of the parents reported participation in support groups for children with disabilities. Eight (center-based = 5; center-based + PIE = 3) reported participating in these support groups. In sum, relatively few parents participated in either parenting classes or support groups and for those who did, the participation was comparable.

Conclusions

The primary purpose of this investigation was to ascertain the immediate and long-term effects on the child with disabilities and the family system of the addition of a parent involvement program to a center-based intervention. In this type of parent involvement program, the parents were trained to provide therapeutic intervention for their children. This longitudinal study was methodologically sound with random assignment to treatment, treatment verification measures, multiple child

Table 13.21

Parents' Report of School and Additional Services

	Center-Based	Center-Based + PIE
In School (n = 52)	28	24
Public	27	23
Private	1	0
Home	0	1
Services at school		
speech therapy	21	15
occupational therapy	9	11
physical therapy	10	8
orientation/mobility therapy	5	2
adaptive P.E.	12	9
behavioral specialist	5	3
Daycare (center or home based)	8	4
Additional services (outside of school services)		
speech therapy	2	3
physical or occupational therapy	2	2
adaptive P.E.	0	3
private therapy	--	--
handicapped children group activity	4	6
additional tutoring	1	6
additional classes	3	2
Parent Involvement		
Hours in parenting program during last 2 years		
10 hours or less	4	1
11 - 30 hours	2	3
over 30 hours	1	2
some time (amount not specified)	3	3
none reported	18	14
Hours in support group related to child's handicap		
less than 100 hours	2	2
over 100 hours	1	0
some time (amount not specified)	2	1
none reported	23	20

and family measures, and "blind" assessment at all posttests. Child development effects, family effects, and later school effects will be summarized.

Some advantage was demonstrated for the children whose parents were in the parent involvement group. On the child development measures across the four posttests, the children in the center-based + PIE group consistently did better than did the children in the center-based group, but only at Posttest #1 and #2 were any of the differences statistically significant ($\underline{p} < .10$). A similar picture emerges when the groups were compared according to the parents' attendance. The children whose parents attended 11 or more of the instructional sessions did statistically significantly better on the personal-social and cognitive subscales at Posttests #1 and #3 and on the cognitive subscale and total DQ at Posttest #2. The Posttest #4 analyses (for BDI and SPECs) revealed that the center-based + PIE group still scored better but that no statistically significant differences were found when comparing the center-based and the center-based + PIE groups or the high attending parents and the center-based group. It appears that the advantage, if real, did not remain over time. It is important to note in these conclusions that both groups of children maintained their total development quotient over the posttests. The children made age-equivalent progress over the 3½ years of the study.

The school data collected at Posttest #4 also appears to show possible benefits from the addition of the parent involvement component. The school placement of the two groups was somewhat different. At Posttest #4, of the children in the parent involvement group, fewer were eligible for special education services, more were in regular classrooms, and fewer were in self-contained classrooms than were the children in the center-based only group (although the differences were not statistically significant). School placement varies with school district and is not necessarily determined by the child's development level. However, these findings, in conjunction with the child development findings, reported above appear to demonstrate that the addition of the parent involvement program might have had a beneficial effect on the children's development.

The comparison of the two groups on the family measures did not show effects on the family system in terms of parenting stress, support, resource, and overall family functioning from the addition of the parent involvement component. The families in both groups across posttests similarly experienced high child-related stress. They also reported similarly available resources and supports. The one difference between the groups was in the family cohesion scores. The center + PIE group maintained a slight advantage in terms of family cohesion scores across posttests, but the difference was not at any time statistically significant. In sum, from the measures used the families in the two groups appeared to be handling their lives equally well.

Differences in parent behaviors were found in some of the parent/child interaction measures at Posttest #1 and the teacher evaluation at Posttest #4. For the parent/child interaction measures, parents who attended the PIE instruction sessions scored statistically significantly higher in the rating of quality of parent behavior in comparison to the parents in the center-based only group. When only the parents who attended 11 or more PIE sessions were compared to the center-based group, the quality and the appropriateness of parent behavior ratings were significantly higher. These differences were not sustained at Posttest #2.

The two groups varied statistically significantly on the teacher's evaluation of the parents' knowledge, support, and attendance at Posttest #4. The parents in the PIE group were judged to be more knowledgeable, supportive, and attend more of the educational meetings than did the parents in the center-based only group. Possibly the curriculum of the PIE program encouraged the parents to be more responsible and involved in their children's education. With the importance of the parent empowerment issue today, the effect of the parent involvement program on later participation in the child's education is an intriguing and important finding that needs further study.

Cost effectiveness is a concern in early intervention. The cost of the addition of the parent involvement program was minimal for the agency. With the effects found, although the results were not entirely conclusive, it appears that the program was cost effective.

The findings of this study demonstrate somewhat different effects of the parent involvement component than do the findings of the Utah Parent Involvement 1985 Study and the Des Moines Study. (These studies are discussed elsewhere in this report.) Together these replicative studies show that questions regarding the efficacy of parent involvement can be studied empirically. The questions are not all answered, but empirically defensible information has been added which will help intervention agencies better plan their programs and define their rationale for involving parents.

ASSOCIATION FOR CHILDREN WITH DOWN SYNDROME (ACDS)

Project #14

COMPARISON: Children with Down syndrome -- center-based program versus center-based program plus Parental Involvement (Individualized Parent Training)

LOCAL CONTACT PERSON: Fredda Stimell, Executive Director, Association for Children with Down Syndrome (ACDS)

EIRI COORDINATOR: Lance Mortensen

LOCATION: Bellmore, NY (Long Island)

DATE OF REPORT: 4-10-1991

Rationale for the Study

Perhaps the most persistent of the popular issues concerning early intervention is the generally accepted statement that involving parents heavily in the intervention programs of their children results in more effective intervention services.

In both the early intervention literature (Peterson & Cooper, 1989) and in a recent statute (P.L. 99-457), a case for parental and family involvement has been made. The case in the research literature has been made almost universally. White et al. (1987), in a review of previous reviews of early intervention efficacy, found that parent involvement was the most commonly cited concomitant variable of intervention effectiveness with 26 of 27 reviewers concluding that "more is better."

Public Law 99-457 mandates the development of an Individualized Family Service Plan (IFSP) and requires that a statement of the family's strengths and needs relating to enhancing the child's development be included as well as the major outcomes expected for the child and the family. Thus, given the great emphasis on parent involvement in the field and in legislative mandates, one might surmise that the major issues related to parental involvement have been explored and there is little need for further research. Three provocative findings suggest that this may not be so.

First, Casto and Mastropieri (1986), in reporting the initial results of a meta-analysis of the early intervention research, found that parents could indeed be effective intervenors; programs that heavily involved parents in addition to primary services provided by professionals did not appear to be any more effective than programs that did not. In addition, they pointed out the fact that most of the studies that had investigated the question of parent involvement directly had been done with children who are disadvantaged rather than children who are disabled, had many methodological flaws, used narrow and often inappropriate outcome measures, and did not verify whether parents in high involvement groups actually participated to the extent they were supposed to in the intervention program.

Second, in reviewing outcome measures used in previous intervention research, Casto and Lewis (1984) found that family outcomes have been assessed infrequently in past research, accounting for less than 10% of outcome measures collected.

Third, White et al. (1989), in a review of 172 early intervention studies that included a substantial parent involvement component, concluded that parental involvement studies could be subdivided into two main categories: (1) studies that used parents to assist in some way with the developmental therapy of their children, and; 2) studies in which some type of support was provided to parents and/or family members. They found that 80% of the studies were limited solely or primarily to using parents as developmental therapists for their children, with support service receiving little research attention.

Given the above findings, it was deemed important to further investigate issues related to parental involvement. Since parents were used principally as therapists in 80% of the studies reviewed by White et al. (1989), this issue was chosen for further investigation.

Overview of the Study

The Association for Children with Down Syndrome (ACDS) had a basic parental involvement program in place before this study was begun. This basic program included a nine-week course in effective parenting, parent support meetings, a fathers' rap group, a sibling group, peer counseling, and general family support services from an ACDS social worker. This relatively "rich" parental involvement program provided an opportunity to ascertain if teaching the experimental group parents specific skills in working with their child would be powerful enough to show group differences as previous research has suggested. Specifically, the research question investigated was whether assisting parents in implementing specific teaching strategies would result in significant gains in child and family outcomes over the existing center-based and parent involvement program.

Program organization. The Association for Children with Down Syndrome (ACDS) preschool program was a privately operated program consisting of several program units directed toward children at various developmental levels. The infant program unit was for children from birth to approximately 14 months of age, while the toddler and preschool program was directed to children from 14 months to 5 years of age. At age 5, children were referred to their local public school district's Committee on Special Education for appropriate educational placement.

Curriculum in the program was based on a Piagetian model of development and assumed that young children with Down syndrome follow the same sequence of development as children without disabilities and can show gains in developmental skills. The primary goals of the program were to have each child with Down syndrome working at his/her optimal potential by identifying learning strategies and effective teaching techniques for the individual child in all the following developmental areas: gross motor, visual-fine motor, communication (receptive and expressive), self-help (feeding, dressing, grooming, and toileting), socialization (awareness of self, adaptation to environment, adaptive behavior, play skills), and cognitive (object permanence, generalization, and concept development). The intervention program evaluated by this study lasted from September 1987 to June 1988.

An underlying assumption of the program was that interventions should be implemented using principles of behavioral psychology and reinforcement. Behavioral interventions were based upon the applied analysis of behavior, were habilitative, prescriptive, and emphasized positive reinforcements that can occur in the educational environment. The goal was to promote developmentally-appropriate and socially accepted patterns of adaptive behavior by reinforcing appropriate behaviors.

ACDS utilized a transdisciplinary approach to the early intervention program consisting of special education teachers, assistant teachers, speech/language pathologists, social workers, psychologists, physical therapists, occupational therapists, nurses, movement and music specialists, volunteers, students and a consulting pediatrician-geneticist. The teacher acted as the team facilitator in integrating the expertise of the entire team. Team meetings were held to discuss the progress of individual children as well as to develop strategies for programming. Staff also met with parents on an individual basis at least once a year or more often as needed.

The curriculum. The basic curriculum for the center based program used a number of published early childhood education and special education curriculums such as: You and your small child (Karnes, M. B., 1982; Circle Pines, American Guidance Service, Inc.); Sequenced Curriculum for the Severely and Profoundly Mentally Retarded and Multiply Handicapped (Kissinger, M. E. M., 1981; Springfield: Charles

Thomas Publisher); Down syndrome programs, University of Washington/Complication of programs (Hayden, A., 1981; Seattle: Child Development and Mental Retardation Center, University of Washington); Time to begin (Dmitrieu, V., 1982; Milton, WA: Caring, Inc.).

A typical instructional day included sensory integration, small and large group instruction (in all areas of development), individual task time, and free exploratory play activities. Throughout the day, a range of therapeutic services were implemented for goals such as eye-to-eye gaze, orientation to name, attending skills, and other adaptive behaviors. As children got older, activities were planned to emphasize independence and functional skills in order to prepare children for integration into the least restrictive environments. Data collected from children's IEPs, formalized assessments, informal behavioral observation, and standardized checklists were used for program evaluation.

As noted earlier, there was a pre-study parent involvement program in place. The parent involvement activities are described below.

Optional intervention services. In addition to the basic program for each group, ACDS provided a variety of additional activities and services for families who chose to participate. Families in either the Basic or Expanded Services group were eligible to participate in these services. Most of these services were provided through the social work/family services department. These services included:

Fathers Meetings - A father's rap group was held several times each year in the evenings and was led by a social worker.

Coffee and Conversations - All parents were invited to group meetings held once per month to gather information, discuss concerns and bring up relevant issues.

Home Visits - Home visits were made on a monthly basis for infants. Toddler families were visited twice yearly. The minimum number was once per year. Families with acute needs received more home visits on an 'as needed' basis.

STEP - Systematic Training for Effective Parenting (American Guidance Service), a program designed to enhance parenting skills, was offered in a nine-week course.

Siblings - Siblings were invited on a specifically planned day to participate in a shortened school day. A series of sibling raps were offered to inform siblings about Down syndrome, enabling them to meet other siblings of children with Down syndrome and provided siblings with an opportunity to express concerns and feelings.

Share - A group meeting was held once per month for the parents of students graduating from ACDS. This was designed to help prepare parents to separate from ACDS, familiarize themselves with the child's needs, become advocates for their children and to understand the available public school programs for Special Education.

Peer Counseling - Peer counselors were parents of children with Down syndrome who received systematic training through the Family Services Department to advise, counsel, and provide support and information to new parents. Peer counselors were available to go to the hospital or the home when new babies with Down syndrome were born. Peer counseling was designed to be short-term and time-limited.

Social Work Services - The social workers served as liaison between the transdisciplinary team and parents. They offered referrals, resources, and concrete services such as: referral to social services, public assistance, food stamps, daycare, etc., as well as providing direct care information for out of state families and agencies. The social worker assisted the child's family and teacher in developing strategies for working with the individual family as well as to help facilitate a parent-professional partnership. Conferences, relating to issues concerning children with Down syndrome and their families, were scheduled. A systematic information data base on all other related services and agencies was established and maintained.

Personnel

Services were provided by a multidisciplinary staff of 75 people who served approximately 130 Down syndrome children. Each child was provided services by a transdisciplinary team that has been assigned to that child. The way in which the staff were incorporated into the program is described next.

Teachers/Assistant Teachers were the primary facilitators of the team. M. S. level special educators were responsible for knowing each child's IEP that has been designed with each team member's input.

Social Workers interfaced with teachers to develop strategies for working with individual families and facilitated a parent-professional relationship.

Psychologists provided child assessment (formal and informal) and parental counseling and training.

Registered Nurses cared for youngsters who did not feel well, and acted as a resource to keep parents and staff up-to-date on health and safety issues.

Speech Pathologists provided the children at ACDS with an intensive speech and language therapy program both on an individual and group basis to minimize the severe delay in the area of language development and speech most children with Down syndrome exhibit.

Physical Therapists followed a neurodevelopmental and sensory integration approach where each child was brought through the stages of development using the prior stage's components as a building block for the next stage.

Occupational Therapists at ACDS worked within the child's occupation (i.e., play) by evaluating and developing a course of therapy to enhance sensory, gross and fine motor, activities of daily living and behavioral and perceptual skills.

The Movement and Dance Specialist worked with children from their earliest months at ACDS. Music, which is stimulating and expressive, helped motivate each child to learn and to use his/her body coordination.

Volunteers (including student and community residents) who came to ACDS from the surrounding communities were trained in specific tasks within the educational program.

Methods

Subjects

All children in the study had Down syndrome. There were 23 preschoolers in the basic parental involvement group and 26 in the expanded parental involvement group.

Recruitment. The project served families with children with Down syndrome in Suffox and Nassau Counties, New York state. A few children from surrounding counties on Long Island were also served through interagency agreements. Subjects qualified for inclusion in the study if they had a diagnosis of Down syndrome. They were then matched according to their performance on the Uniform Performance Assessment System (UPAS) and randomly assigned to the existing parental involvement program or to the expanded parental involvement program. Children who had Down syndrome and other complicating conditions (need of additional family support, severe developmental delay, seizures or other medical difficulties) were enrolled in the ACDS "Extended Day Classroom," and were not included in the study. All families in the program were invited to participate through written announcements and group discussions led by program staff and EIRI personnel. All families who elected to participate underwent an informed consent procedure and signed consent forms. A few families chose not to participate due to personal reasons and to involvement in other research.

Assignment to groups. Developmental level in months was measured by the child's score on the full Uniform Performance Assessment System (UPAS) that was administered by classroom teachers in the fall of 1986. Names were listed in six groupings by chronological age of the child. Groups were: 0-13 months; 14-20 months; 21-28 months; 29-36 months; 37-45 months; 46-58 months. The list also included information concerning sex of the child and whether the child had a heart condition. The first two names on the list were considered a pair, the third and fourth a second pair, and so on through the list. In each of the pairs the first member was assigned a group by the use of a table of random numbers. The other member of the pair was assigned to the other group.

Demographic characteristics. The basic parental involvement group and expanded parental involvement group were compared for gender distribution and heart condition and found to be similar. Tables 14.1 and 14.2 depict demographic characteristics and show pretest performance for children in each group. As may be noted, both groups were statistically significantly different at pretest in only one area at the .05 level and 3 additional areas at the .10 level. The expanded intervention group reported fewer stressful life events at time of pretest ($p = .05$). This variable and the years of education for fathers (.06) were used as covariates in posttest analyses

Subject attrition. One child died of a respiratory condition during 1988. This subject was the only attrition the study suffered. Twenty-six children and their families were treated during the 1987-88 year and were the group used for follow-up. Twenty-three children and their families constituted the comparison group.

Intervention Programs

Children participating in both groups received the same basic center-based program, which included the types of parent involvement described above. Those children in the expanded parental involvement program received additional individualized parent involvement activities. The content of both programs is described below.

Table 14.1

Comparability of Groups on Demographic Characteristics for New York Study

	Basic Intervention			Expanded Intervention					
Variable	$\bar{X}$	SD	n	$\bar{X}$	SD	n	p Value	ANOVA F	ES
• Age of child in months as of 7/1/88	33.3	(14.9)	23	34.1	(15.0)	26	.86	.03	+.05
• Age of mother in years	36.6	(4.8)	20	35.1	(5.1)	24	.74	.11	-.31
• Age of father in years	37.1	(5.1)	20	36.6	(5.6)	24	.78	.08	-.10
• Percent Male*	52.2	---	23	53.9	---	26	.91		
• Years of Education for Mother	14.4	(1.8)	23	14.2	(2.0)	24	.68	.17	+.11
• Years of Education for Father	15.4	(1.8)	22	14.2	(2.2)	24	.06	3.85	-.67
• Percent with both parents living at home*	100	---	23	92	---	24	.16	2.0	-.41
• Percent of children who are are Caucasian*	100	---	23	100	---	24	1.00	.00	.00
• Hours per week mother employed	7.0	(11.1)	23	8.6	(13.7)	24	.68	.18	+.14
• Hours per week father employed	42.4	(7.3)	19	41.8	(5.8)	18	.79	.07	-.08
• Percent of mothers employed as technical/managerial or above*	17.0	---	23	17.0	---	24	.95	.00	-.02
• Percent of fathers employed as technical/managerial or above*	52.4	---	23	71.4	---	21	.20	1.7	+.39
• Total household income	$52,045	($22,994)	22	$55,304	($20,724)	23	.62	.25	+.14
• Percent of income spent on unreimbursed medical/educ. expenses for child	4.0	---	16	2.0	---	13	.43	.62	+.30
• Percent receiving public assistance*	4.3	---	23	11.5	---	24	.33	.98	-.29
• Percent of children in daycare more than 5 hours per week*	4.4	---	23	4.4	---	23	1.0	.00	.00
• Number of siblings	1.4	(1.1)	23	1.6	(1.2)	23	.70	.15	+.18
• Percent with English as	100	---	23	100	---	23	1.0	.00	.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

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Table 14.2

Comparability of Groups on Pretest Measures for New York Study

	Basic Intervention				Expanded Intervention						
	$\bar{X}$	(SD)	%ile	n	$\bar{X}$	(SD)	%ile	n	ANOVA F	ES[^]	P Value
● Age in months at Pretest	32.3	(14.9)		23	33.1	(15.0)		26	.03	+.05	.86
● Battelle Developmental Inventory (BDI)											
Raw Scores for:											
Personal Social	75.4	(28.0)		23	82.1	(34.8)		26	.54	+.24	.46
Adaptive Behavior	48.5	(27.3)		23	51.1	(17.2)		26	.33	+.10	.57
Gross Motor	40.0	(19.9)		23	40.3	(17.7)		26	.00	+.02	.96
Fine Motor	21.9	(21.4)		23	23.8	(8.9)		26	.67	+.09	.42
Receptive	13.9	(36.9)		23	15.0	(5.4)		26	.63	+.03	.43
Expressive	16.5	(25.1)		23	18.6	(7.8)		26	1.03	+.08	.32
Cognitive Total	25.4	(7.5)		23	27.1	(8.9)		26	.51	+.23	.48
TOTAL	241.7	(77.3)		23	258.4	(95.1)		26	.45	+.22	.51
● Parent Stress Index (PSI)[']											
Child Related (range 50 to 235)	102.2	(17.2)	60	23	104.0	(20.9)	64	25	.10	-.10	.75
Other Related (range 54 to 270)	119.4	(33.6)	46	23	114.5	(25.8)	40	25	.33	+.15	.57
TOTAL (range 101 to 505)	221.5	(46.9)	50	23	218.4	(44.9)	46	25	.05	+.07	.82
• Family Adaptation and Cohesion Evaluation Scales (FACES)[*]											
Adaptation (range 0 to 24)	5.22	(3.0)		23	3.69	(2.8)		25	3.36	+.51	.07
Cohesion (range 0 to 30)	4.42	(3.4)		23	5.21	(3.0)		25	.18	-.23	.67
Discrepancy (range -80 to 80)	12.1	(8.0)		23	9.4	(9.5)		25	1.1	+.34	.30
TOTAL (range 0 to 80)	7.74	(3.2)		23	6.92)	(3.0)		25	.85	+.26	.36
• Family Resource Scale (FRS)[&]	126.2	(17.5)	65	23	132.2	(16.4)	75	25	1.52	+.34	.22
• Family Support Scale (FSS)[&]	36.8	(11.2)	77	23	32.6	(12.8)	69	25	1.47	-.38	.23
• Family Index of Life Events (FILE)[']	10.0	(6.6)	40	23	6.4	(5.9)	69	26	3.95	+.55	.05

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size.

['] Statistical analysis estimates for PSI and FILE were based on raw scores where low raw scores are more desireable.

[*] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best (see Appendix A for details).

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated by the family as being available. Higher scores are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies.

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Basic intervention. Both groups received the basic services of the ongoing ACDS center-based programs. This program varied depending on the age of the child as described below.

Infant Classes were held at the school two times per week where parents and infants met for individual direct service programming with the transdisciplinary team. Individualized programs were developed and implemented during two hours of direct services. At each session, parents received written suggestions and printed educational materials for them to continue working on at home. Pertinent workshops were presented on a monthly basis, which also included rap sessions for parents. In addition, monthly home visits were made by the infant teachers. Specialists may also have accompanied an infant teacher on a home visit. The infant program included children of age 2 months to 14 months. An average day included:

9:30 - 9:45	Movement therapy which included dancing and exercising
9:45 - 11:30	Direct services, with parents, infants, transdisciplinary team members to individualize sensory stimulation programming
11:30 - 12:30	Parents from morning and afternoon classes meet for Rap with the Family Services Department. During this time the children remain in the infant classroom with the transdisciplinary team and interventions are continued. Afternoon Class - p.m. Parents come to classroom after Rap and follow same schedule as above.

The Toddler and Preschool Classes were held at the school for three hours a day five days per week. Children were transported via bus or by their parents to the school. Notebooks were used for daily communication between staff and parents. Formal parent-teacher IEP conferences were held a minimum of twice per year. Parents received a mid-year and year-end developmental report on their child's progress. Individual and group social services to the families were available on an "as needed" basis. Home visits were made by staff members on a twice yearly basis. An open door policy was maintained for the first few weeks of the toddler program or for any child starting school for the first time in a preschool class to facilitate the child's adjustment to the classroom. Parents were otherwise requested to schedule visits a minimum of once per month to see appropriate personnel and to participate in the classroom programming and learn techniques that they could carry out at home with their child. Workshops were offered to parents on topics of interest by specialists from ACDS as well as outside professionals. A typical daily schedule for a younger toddler included:

9:30 - 10:00	Sensory stimulation/free play
10:00 - 10:45	Small group activity. Children are taken from the group for individual work on developmentally appropriate tasks and to receive therapy.
10:45 - 11:00	Large and small group activity as well as painting, shaving cream, rice, water, and other sensory play.
11:00 - 11:30	Gross motor activity. Obstacle course with tunnels chairs, ladders, etc. Also circle time to teach concepts such as in-out, on-off, and to play drums, bells, or sticks. Music to learn name, eye-to-eye gaze, attending skills/feeding skills.
11:30 - 12:00	Lunch time
12:00 - 12:30	Language circle, learn words and free play while getting ready for bus.

A typical daily schedule for an older toddler included:

9:30 - 10:00	Exercise gross motor and sensory stimulation
10:00 - 10:45	Individual task and therapist time, small group/free play
10:45 - 11:00	Large and small group, arts and crafts using sensory materials
11:00 - 11:30	Gross motor course, concept circle, teaching songs and name identification.
11:30 - 12:00	Lunch/feeding
12:00 - 12:30	Free play, story, group activities
12:30	Dismissal

Process for selecting child's goals. Children in all units were trained on specific individual skills as determined by the following procedures:

- Behavioral observation of child by teacher/OT & PT/speech therapist/psychologist using checklists as guideline.
- Transdisciplinary team meeting to discuss the developmental needs of the child.

- Specific target behavior selected and criteria for acquisition of behavior determined in transdisciplinary team meeting.
- Baseline behavior observed on target behavior by psychologist or trained observer in classroom using General Observation Sheet.
- If work on behavior was appropriate as seen by baseline observation it is discussed with parents.
- Teacher and/or other staff members trained to implement in classroom.

The pool of potential behaviors to be addressed as a part of the intervention program came from developmental assessments made by physical and occupational therapists, speech therapists, and teachers. Each of these professionals used assessment tools that emphasized their particular training expertise. For example, the teachers used the Uniform Performance Assessment System (UPAS), a curriculum-based criterion referenced scale which divides developmental skills into: pre-academic, communication, social/self-help, gross motor categories, and includes a specific inappropriate behavior checklist. Items for the UPAS were taken from existing developmental scales.

Professionals trained in disciplines other than teaching used instruments and procedures designed to focus on child developmental status in those areas of specific expertise of the particular discipline. For example, physical therapists assessed mobility skills, and occupational therapists assessed functional movement patterns. Speech, language, and communication skills were assessed by the speech therapists. Items from all of these child performance assessments were collected on checklists that were kept in the child's folder and updated daily. Rather than relying on the memory of those working with the child, the exact number of occurrences of specific behaviors of each child were observed and recorded.

After data from various instruments and clinical assessment were summarized during weekly staff meetings, behaviors that the child was ready to learn were isolated and staff discussed the child's current overall functioning to select the most salient behaviors to be addressed as a part of the intervention for that child.

Parents gave routine written and verbal input on areas of concern to them. These areas were observed and assessed by staff. When all of these measures had been integrated, the situation was discussed with parents and specific training sequences were developed that included the child's most immediate needs and the materials and rewards that were most effective with the child.

Although any of the over 100 pages of items on the transdisciplinary assessment instruments could have been identified as the child's most appropriate and significant learning need, certain skills were identified more frequently as being needed by children with Down syndrome in the birth to five year age range. Behavioral training programs had previously been written for some 60 skills. Additional programs were written as the process described above had identified other skills pertinent to a particular child's development. Each of these programs was described as a specific sequence with suggestions for rewards and criteria for completion included. These training programs were implemented by the staff in the center-based program.

Expanded intervention. Parents in the expanded parental involvement group received the same services as parents in the Basic Services Group except they were also given additional services designed to enhance their abilities to tutor their child in specified skill areas. A series of videotapes were developed by project staff to use in training parents to teach certain specified skills to their child.

Five basic areas were covered on the tapes. They included: (1) having the child come to the parent; (2) compliance training; (3) preacademic, quantitative, and linguistic learning; (4) toilet training; and (5) prosocial behavior. The videotapes were made by the school psychologists and used live actors for realism. Examples were interspersed with the training of the parents for each category. Practical examples were used (such as rewarding the child for coming when called) so parents could easily see what the desired behavior was and how to reinforce it.

ACDS staff who were experienced in working with parents had found that although parents might learn to teach one skill effectively, and there may have been general understanding of a new concept, it was necessary to train parents for each new skill. The videotapes targeted compliance behaviors as well as skills in critical developmental areas.

The parents in the expanded intervention group were trained individually in the use of the procedures to teach the skills needed by the child and were asked to work with the child at home. This training included teaching the parent the procedures to be used and criteria for attainment of the skill. Parents were then required to demonstrate their ability to teach the skill. Repeated contact was made by a licensed psychologist. Training included a monthly 1 hour face-to-face individual tutorial session, and weekly follow-up telephone calls by the same psychologist.Parents were also be given a written copy of the training sequence and a calendar-like chart to keep a record of home training completed. Parents used the record as a prompt to tell the psychologist during the weekly call of the amount of training activities performed. The project social worker also contracted parents to ensure that the parents' intervention activities were proceeding smoothly. When a child reached criteria on each skill, a new program was implemented on the next target skill to be trained.

Treatment Verification

A number of procedures were used to verify that treatment was implemented as intended. They included:

Collection of attendance data. Child attendance in the regular program was recorded. The parent's attendance at training sessions was also recorded. Reasons for any extended absences were recorded. Experimental group children attended an average of 170 days. Comparison group children averaged 174 days in attendance.

Optional service attendance. As seen in Table 14.3 both the basic and expanded groups had approximately the same attendance to the optional services. Because so many different optional services were offered, it was thought expedient to check parents' attendance at activities in case there was a difference between the basic and expanded groups.

Table 14.3

Optional Service Attendance for Basic and Expanded Services Groups

	Basic		Expanded	
Activity	N	(%)	N	(%)
Back-to-School Day	16	(70)	19	(73)
Sibling Day	13	(57)	13	(50)
Father's Breakfast	9	(40)	11	(42)
Holiday Party	8	(35)	11	(42)
IEP Conference	18	(78)	23	(88)
Special Friend's Day	10	(43)	6	(23)
Average Number of Parent Participation in Classroom*	4.1	(46)	3.9	(43)
TOTAL NUMBER OF FAMILIES	***23***		***26***	

*Parents were asked to participate once a month in the classroom. There were a total of nine times (9 months) parents were asked to participate.

Parent report of tutoring at home. Parents in the expanded services group were called weekly to report to the psychologist who performed the individual training of the amount of training actually implemented each day and to discuss any problems occurring during tutoring.

Site review. A formal site visit was made June 1, 1988, by the site coordinator and Diane Crutcher, who was then the Executive Director of the National Down Syndrome Congress. The site review was conducted by Carol Tingey of USU; Diane Crutcher, Executive Director of the National Down Syndrome Congress; Emily Lewis, Assistant to the Executive Director of the Association for Children with Down Syndrome; and Fredda Stimell, Executive Director of the Association for Children with Down Syndrome. Two parents from the program also participated. The site review was conducted as part of the treatment verification process, which is described in the Treatment Verification Handbook for Research Sites (EIRI, 1987) and was implemented according to the general procedures described in the Guide for Site Reviews for EIRI Research Sites, which is found in Part II of the handbook.

The site review team members evaluated the program through information gained from observations of early intervention, interviews with the service delivery staff, examination of the child folders, and inspection of the facility. The site review team evaluated the program in four categories: (1) services for children, (2) interactions between staff and children, (3) curriculum, and (4) administration and management. A complete description of the site review is available upon request.

The results of the Services to Children category showed that appropriate assessment procedures are used, both at entry and at periodic times, and that every child folder checked had a current IEP with input from parents as well as the staff.

Results from the Interaction Between Staff and Children category showed that children received both individualized attention and the opportunity to appropriately act independently. The curriculum activities were appropriately designed, and the classroom environment was bright and attractive. The Administration and Management category also showed signs of exemplary status, as the ACDS staff is both well qualified and evaluated regularly. The supervisory board meets at least monthly, and the professional advisory board at least biannually. In sum, results of the site review indicated that all criteria were fully met in all categories. Based on these findings, no further recommendations were offered.

Cost of alternative programs. The cost for the basic center-based program and the center-based plus parent involvement program was determined using the ingredients approach (Levin, 1983). The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several year, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time. For both programs, ingredients included direct service and administrative staff, occupancy, equipment, materials and supplies, miscellaneous, and contributed resources. The cost of the center-based plus parent involvement program is simply the cost of the basic center-based program available to 121 children plus the additional direct service, administrative, materials and supplies, miscellaneous, and parent resources required to operate the parent involvement program for 26 children during 1987-88. Table 14.4 presents the cost per child of these resources consumed by each program in 1990 dollars and at several discount rates.

Table 14.4

Cost per Child for New York ACDS (1987-88)

Resources	Center-Based	Center-Based & Parent
1. **UNDISCOUNTED**		
Agency Resources		
Direct service personnel	$ 7,603	$ 7,956
Administration	552	620
Occupancy	1,128	1,128
Equipment	128	128
Materials/supplies	239	284
Miscellaneous	299	321
SUBTOTAL	**$ 9,949**	**$10,437**
Contributed Resources		
Volunteer Time	1,566	1,566
Parent Time	0	726
Transportation	2,500	2,500
SUBTOTAL	**$ 4,066**	**$ 4,792**
Total	***$14,015***	***$15,229***
2. **DISCOUNTED (3%)**		
Total agency resources	$10,872	$11,405
Total resources	15,315	16,641
3. **DISCOUNTED (5%)**		
Total agency resources	$11,517	$12,082
Total resources	16,224	17,629

NOTE: Totals may not add up due to rounding errors.

Direct service and administrative personnel costs included the base salaries plus benefits according to the percentage of FTE allocated to each program. Occupancy charges included the annual rent the ACDS program paid for the facility in which it is housed, an annualized cost for capital improvements, as well as utilities, and insurance costs. Equipment costs were based on insurance estimates of the market replacement value of the buildings' contents, which were annualized to account for interest and depreciation. Materials and supplies and miscellaneous charges were based on actual expenditures by each program on these resources. Contributed resources included parent and volunteer time and child transportation. Community members volunteered 13,400 hours, and student interns volunteered 435 hours. The estimate of parent time is based on the time parents spent in training sessions, telephone contact with the sociologist and psychologist, and the time recommended by the program for working at home with their child. Total parent time was estimated at 72 hours. While program records were available for the amount of time parents spent in training and in phone contact, parent time spent working with their children at home was not available and was thus estimated based on what the program recommends. In addition, pediatric and cardiological examinations were contributed by the medical community. The cost for medical team visits were based on their market value. Finally, the State of New York provided door-to-door transportation for the children at no direct charge to ACDS or the parents. The cost of this service is estimated based on a survey of preschool special education transportation costs (Escobar et al., 1988).

Data Collection

Outcome data were collected for children and families in both groups in the spring of 1988. Measures were selected to measure the effects of the program on both children and families in a way that allowed comparison to other studies of early intervention as well as focusing in on some of the unique questions generated by this particular study.

Recruitment, training, and monitoring of diagnosticians. An assessment coordinator and five diagnosticians were trained at the site by the EIRI assessment coordinator on September 2 and 3, 1987. The coordinator was a licensed school psychologist and had experience working with children who have Down syndrome. The diagnosticians had experience and training with assessment for children with disabilities. All assessment personnel reached criteria on training materials, and pre- and posttesting for 1987 was completed without difficulty. The protocols were essentially error free.

Pretesting. After parent consent was obtained and children were assigned to groups according to their scores on the UPAS, parents were contacted and individual appointments were made with parents for the pretest battery consisting of: Battelle Developmental Inventory (BDI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events and Changes (FILE) and the Family Adaptability and Cohesion Evaluation Scales (FACES III). The BDI was administered by a trained diagnostician who was not involved in providing other services to the family or the project and who was unaware of the child's group assignment. Testing occurred at the center where services were provided to all families. Parent report measures were completed by the parents and returned to the diagnostician coordinator.

Pretesting in the Fall of 1987 was completed during the month of September. Parents were each paid $20 for participating. Since the newly trained personnel all had considerable experience testing preschool children in other early intervention projects in the area, their experience with children and families made the testing procedure run smoothly. Data concerning the children's progress on the UPAS was collected in the regular methods and was included in the information concerning pretest status of the children.

Posttesting. Posttesting occurred during the last two weeks of May and the first week of June 1988. Appointments were made by the diagnostician coordinator, and assessments were completed by trained diagnosticians who did not provide other services to the family or the project and who were unaware of the child's group assignment. In addition to the pretest measures, the child's progress was measured on the Vineland Adaptive Behavior Scale (to show behavioral attainment), Receptive Expressive Emergent Language Scale (REEL) (to show communication competence), and the Uniform Performance Assessment System (UPAS) as an additional measure of child gain, and the child's behavioral style or temperament was assessed using the Carey Temperament Scale. Parent's skill in working with the child on the target behavior was recorded on videotape for analysis. A 3-point scale was developed to code the parent and child interaction on these tapes. The degree of involvement of the parents as reported by the staff was further delineated to get more accurate information concerning the effectiveness of the additional parent training. In addition to progress as measured by the formal assessments, children were videotaped in the classroom on the target behaviors. These teacher/child tapes were scored similar to the parent/child tapes.

Results and Discussion

Results of posttest measures of child and family functioning are presented in Table 14.5. Results of the child functioning measures indicate that there were no statistically significant differences at posttest between the basic and expanded intervention groups on any of the measures.

The results of posttest measures of family functioning appear as Table 14.6 From this table, it may be seen that there were no statistically significant differences at posttest between the groups. The consistent low effect sizes also demonstrate how little difference there actually was between these two groups. The FACES total score was significant at the .10 level and seems consistent with the trend of the FACES subscales, but because of the large number of analyses done it is more than possible that this difference is due to sampling error.

Table 14.5

Posttest Measures of Child Functioning for Alternative Intervention Groups for New York Study

		[*] Basic Intervention Group				Expanded Intervention Group						
Variable	Covariates[&*]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	P Value	ES[^]
• Age in months at posttest		40.6	(15.5)		23	41.1	(14.9)		26	.01	.91	.03
• **Battelle Developmental Inventory (BDI)**[*]												
Raw Scores												
Personal Social	1,2,3	83.6	(27.2)	88.3	23	92.7	(31.0)	88.5	26	.00	.97	.01
Adaptive Behavior	1,2,4	54.4	(13.1)	55.7	23	58.1	(13.7)	57.0	26	.42	.52	.10
Gross Motor	1,2,5	46.6	(15.2)	47.2	23	45.3	(14.7)	44.8	26	1.63	.21	-.16
Fine Motor	1,2,6	28.8	(8.2)	30.0	23	20.0	(9.9)	29.0	26	.34	.56	-.12
Receptive	1,2,7	16.5	(5.0)	17.3	23	16.9	(3.4)	16.2	26	1.53	.22	-.22
Expressive	1,2,8	20.1	(6.8)	20.8	23	20.5	(7.5)	19.9	26	.45	.51	-.13
Cognitive	1,2,9	29.7	(9.8)	30.9	23	31.7	(10.6)	30.5	26	.08	.78	-.04
BDI Total	1,2,10	283.2	(78.3)	294.9	23	295.3	(25.4)	284.9	26	1.11	.30	-.13
• **REEL** (Age Equivalent)												
Receptive	1,2,11	21.0	(10.5)	22.3	22	21.6	(9.0)	22.2	26	.39	.54	-.01
Expressive	1,2,12	16.2	(10.8)	15.2	22	17.6	(11.0)	18.4	26	.87	.36	.30
• **UPAS** (Age Equivalent)	1,2,13	31.8	(12.4)	33.5	23	32.9	(14.3)	31.4	26	2.62	.11	-.17
• **Vineland**												
Raw Scores												
Receptive	1,2,7	20.2	(3.8)	20.6	23	20.7	(3.1)	20.3	26	.10	.76	-.08
Expressive	1,2,8	16.8	(9.2)	17.7	23	19.2	(11.3)	18.3	26	.08	.78	.07
Daily Living Skills	1,2,10	38.4	(16.6)	41.6	23	41.3	(20.0)	38.5	26	1.86	.18	-.19
Socialization	1,2,3	41.3	(7.8)	42.7	23	43.2	(10.3)	41.9	26	.15	.71	-.10
Gross Motor	1,2,5	20.7	(7.5)	21.2	23	21.0	(7.0)	20.6	26	.41	.53	-.08
Fine Motor	1,2,6	13.1	(4.4)	13.8	23	13.9	(4.8)	13.4	26	.21	.65	-.09
Adaptive Behavior	1,2,10	64.8	(13.0)	64.3	23	66.2	(13.3)	66.7	26	.43	.52	.18
• **Carey**[#]												
Child's Temperament	1,2	3.4	(.3)	3.4	23	3.3	(.3)	3.3	23	1.40	.24	.33
Mother's View of Child	1,2	2.0	(.9)	1.9	23	2.0	(1.0)	21.0	20	.34	.56	.22

[&] Covariates are all raw scores except where noted: 1 = Pretest FILE; 2 = Education of Father; 3 = BDI Pretest Personal/Social; 4 = BDI Pretest Adaptive; 5 = BDI Pretest Gross Motor; 6 = BDI Pretest Fine Motor; 7 = BDI Pretest Receptive; 8 = BDI Pretest Expressive; 9 = Pretest Cognitive; 10 = BDI Pretest Total; 11 = BDI Receptive AE; 12 = BDI Expressive AE; 13 = BDI Total AE

[*] The means for basic or expanded education of father pretest scores were used in place of missing data so computations could be made. There was one missing basic and two missing expanded education of father pretest scores.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size).

[#] On the Carey scale, all child indices were averaged into one score. The possible ranges were from 1 (perfect baby) to 6 (most difficult baby), thus higher scores are worse. The mother's view of child was rated as: 1 = worse than average; 2 = average; 3 = better than average.

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Table 14.6

Posttest Measures of Family Functioning for Alternative Intervention Groups for the New York Study

		Basic Intervention Group					Expanded Intervention Group							
Variable	Covariate[♣]	$\bar{x}$	(SD)	Adj$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj$\bar{x}$	%ile	n	ANCOVA F	P Value	ES[^]
Parenting Stress Index (PSI)[▲]														
Child Related (range 50 to 235)	1,2,3	108.7	(18.8)	108.8	71	23	104.4	(15.2)	104.3	64	24	.68	.41	.24
Other Related (range 54 to 270)	1,2,4	113.7	(30.1)	111.9	35	23	110.5	(20.7)	112.2	35	24	.00	.98	-.01
TOTAL (range 104 to 505)	1,2,5	222.3	(44.7)	220.8	49	23	214.7	(29.3)	216.1	45	24	.15	.70	.11
Family Adaptation and Cohesion Evaluation Scales (FACES)[•]														
Adaptation (range 0 to 24)	1,2,6	5.6	(3.7)	5.2		23	4.0	(1.9)	4.2		23	1.19	.28	.27
Cohesion (range 0 to 30)	1,2,7	4.7	(4.1)	5.3		23	4.9	(3.6)	4.1		23	1.41	.24	.29
Discrepancy (range 0 to 80)	1,2,8	10.9	(9.2)	11.1		23	11.6	(16.6)	11.4		23	.01	.94	-.03
TOTAL (range 0 to 54)	1,2,9	8.3	(3.8)	8.4		23	6.7	(3.4)	6.3		23	3.50	.07	.55
Family Resource Scale (FRS)[&]														
Time Availability	1,2,10	40.9	(10.7)	42.4		23	44.0	(8.3)	42.6		24	.00	.93	.02
External Support	1,2,11	25.5	(3.5)	25.6		23	26.0	(4.0)	25.9		24	.07	.79	.09
TOTAL	1,2,12	126.4	(15.1)	128.2	66	23	129.3	(12.2)	127.6	52	24	.02	.89	-.04
Family Support Scale FSS[&]	1,2,13	33.4	(10.3)	33.4	66	23	30.8	(12.3)	30.7	63	24	.58	.45	-.26
Family Index of Life Events (FILE)[▲]	1,2	8.3	(5.5)	7.0	62	23	7.5	(6.9)	8.7	47	24	1.21	.28	-.31

[♣] Covariates: 1 = Pretest FILE; 2 = Pretest Education of Father; 3 = Pretest Child PSI; 4 = Pretest Other PSI; 5 = Pretest Total PSI; 6 = Pretest Adaptation; 7 = Pretest Cohesion; 8 = Pretest Discrepancy; 9 = Pretest FACES Total; 10 = Pretest Time Availability; 11 = Pretest External Support; 12 = Pretest FRS Total; 13 = Pretest FSS.

[^] Effect Size (ES) is defined here as the difference between the groups (Expanded minus Basic) on the ANCOVA scores, divided by the standard deviation of the Basic Intervention Group (see Cohen, 1977; Glass, 1976; Tallmadge, 1977 for a more general discussion of the concept of Effect Size.

[▲] Because high raw scores are related to low percentiles, low raw scores and high percentiles are considered better.

[•] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[&] Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for this measure. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal studies.

A series of further analyses were done to test for other group differences. The first analysis tested whether actual attendance of parent and family members at optional family events, such as the father's breakfast and sibling rap groups, was associated with higher scores on child and family measures. This analysis did not reveal any significant differences between attenders and non-attenders. Next, the amount of time children with disabilities in both groups spent in daycare was examined to see if a relationship existed between amount of time in daycare and scores on posttest measures. There were no significant differences on this measure. Finally, videotaped records of parent/child and teacher/child sessions were reviewed to determine if group differences existed. Results of this analysis showed no difference in the parent-child nor in the teacher/child interactions.

Conclusions

As noted earlier, the rationale for doing this particular study was the thought that equipping parents with specific skills to use in enhancing the developmental progress of their children would augment the regular parental involvement program enough to result in significant differences between experimental and control groups on project outcome measures. Much previous research had suggested that this would be the case. Instead, there were few differences between the groups on project outcome measures. The most logical explanation for this finding is that the expanded parental involvement program was not significantly different enough or intense enough to produce group differences. An alternative explanation would be that the effects of the existing intervention program itself were so powerful that the parental involvement component contributed very little to intervention effectiveness. We conclude from the findings of this study that teaching parents specific skills required to enhance the developmental progress of their infants and children was not powerful enough to improve on gains made through the regular intervention program.

ARKANSAS SCHOOL FOR THE DEAF

Project #15

COMPARISON: Hearing Impaired Children -- Oral versus total communication (TC) training.

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LOCATION: Little Rock, Arkansas.

DATE OF REPORT: 4-10-1991

Rationale for the Study

Over the years there has been a nation-wide controversy regarding the communication mode used in educating children with hearing impairments (Greenberg, Calderon, & Kusche, 1984). Some argue that total communication provides children with a better chance at early, critical language and cognitive development and most adequately prepares them for life in hearing and deaf communities. Alternatively, some argue that oral communication provides children with a better chance of developing oral language skills they will rely on most in the hearing world. Arguments accompanying these two stances are complex and the controversy remains largely unresolved. Despite the heated nature of this controversy, little well-controlled research has been conducted addressing the issue of the comparative benefits of each mode of communication used as an aspect of early intervention. This investigation compared the effects of two modes of communication as alternative forms of intervention on overall development of preschool children with hearing impairments, with particular emphasis on language skill development. Since increasing emphasis in early intervention is placed on family-related needs and involvement, the impact of communication mode on family functioning was also addressed.

Review of Related Research

While proponents of oral/aural (use of spoken communication and development of residual hearing, hereafter referred to as "Oral") and total communication (use of spoken language and development of residual hearing complemented by formal sign language and/or informal gestures, hereafter referred to as "TC") have long argued the relative benefits of these two approaches to education of children with hearing impairments (White & Stevenson, 1975), empirical evidence in support of one method over the other remains inconclusive. Grove and Rodda (1984) reviewed studies indicating that children in TC programs had better cognitive and language skills than children in Oral programs, while Nix (1981) reported only studies with the opposite findings in his review. The studies reviewed by Nix led him to question claims made by proponents of TC programs that children's auditory and verbal skills are enhanced by the use of signs.

Research directly comparing Oral with TC approaches has been conducted using quasi experiments with matched samples (e.g. Greenberg et al., 1984; Vernon & Koh, 1970), or have evaluated the use of a particular communication mode using a pretest-posttest design. Further, very little data on early intervention with hearing impaired preschoolers, per se, are available. We have been able to find only two studies of early intervention with hearing impaired children which have comparatively addressed the Oral/TC issue. In one of these studies, Greenberg et al. (1984) found no statistically significant differences in communicative competence among children who received Oral/aural or total communication training, but did report that TC children had longer, more complex interactions with their mothers than Oral children did. These differences in parent-child interaction may have implications for family functioning. Moores (1974) compared children (2½ to 4½ years of age) in seven preschool programs over a four year period. Four of the programs used an Oral/aural approach, one used TC, and two used the Rochester method (i.e., word for word finger-spelling) at the start of the study, but by the end of the fourth year, only one program was still using the Oral/aural approach. Despite this confound, Moores concluded that early use of TC is a significant predictor of success in both communication skill and academic achievement. While the Greenberg study had fewer design flaws than Moores's study, both contained threats to their internal validity, such as questions about the comparability of children in the two groups, inadequate descriptions of intervention strategies, and questionable adequacy of the measures used.

This study addressed issues raised in prior studies of children with hearing impairments by using random assignment to groups, careful description of children and families included, selection of assessment measures that focus on communication skills as well as cognitive and general development, and continuous monitoring of treatment implementation. To establish the comparability of children in each of the groups, data are presented regarding aided and unaided hearing losses of participating children, their ages, length of exposure to Oral and/or TC programs, pretest scores on the Battelle Developmental Inventory (BDI), a parent rating of general health, indication of other services received, and parent hearing status. Family demographic measures are also presented, including socioeconomic status (SES), number of siblings and adults in the home, and racial group membership. The intervention strategy is fully described, and measures of child progress include instruments that were either developed specifically for hearing impaired populations or have been specifically adapted for use with children with hearing impairments.

Methods

The Arkansas School for the Deaf preschool network consists of 10 center-based preschool sites throughout Arkansas, five of which participated in this study. Each teacher at these five sites identified at least four children and their families willing to participate in the research program, and these children were enrolled in the project. The participating sites were located in Fayetteville, Forrest City, Fort Smith, Little Rock, and Russellville, Arkansas.

A three hour, two-day-per-week, center-based program for children with hearing impairments was conducted at the five sites. In addition, the preschool teachers made home visits to the families in both groups using the SKI-HI program for home intervention with families of children with hearing impairments. A comprehensive set of treatment verification procedures were employed to document both treatment group differences and overall program quality.

Subjects

A total of 32 children and their parents were included as subjects in the study. The following section will summarize the methods used in recruiting and assigning subjects to treatment groups. Additionally, results of the assignment to groups will be presented with respect to demographic characteristics and hearing loss and attrition that was experienced during the course of the three year study.

Recruitment. Children participating in the early intervention programs at the Arkansas School for the Deaf qualified for participation in the research on the basis of their degree of hearing loss. They had an unaided hearing loss of at least 50 decibels (DB) in the better ear. An unaided hearing loss of between 50 and 90 DB was considered moderate to severe, and a loss greater than 90 DB was considered profound. Children with additional disabilities were not eligible, with the exception of one child in the study who had mild cerebral palsy.

Parents of all children who met these criteria were contacted and given information about the research, and signed consent was obtained for approximately 90% of these children. Recruitment for this study ended in October, 1987.

Assignment to groups. Children were randomly assigned to Oral or TC groups after stratification by level of hearing loss within preschool site (stratified by moderate or profound losses). After stratification according to hearing loss, subjects were randomly assigned to groups by the EIRI coordinator to ensure that no program staff had knowledge of what program a particular child would receive. For a complete description of the assignment procedures, see the 1986 Annual Report of the Early Intervention Effectiveness Institute.

Subject attrition. As can be seen in Table 15.1, a total of 10 subjects dropped out of the study between pretest and the third posttest. Attrition was gradual. Thus, the first and second posttests have considerable more subjects than the third posttest. The main reason for attrition was parental preference toward a different mode of communication, although two of the subjects dropped out because they moved out of the state and could not be located. One subject was not located for the second posttest but was located for the third posttest.

Table 15.1

Summary of Attrition at the Arkansas Hearing Impaired Study

	Oral Communication	Total Communication	Total
Pretest	n = 16	n = 16	32
Posttest #1	n = 14 Attrition = 2	n = 16	30
Posttest #2	n = 12 Attrition = 2	n = 13 Attrition = 2 Temp. Attrition = 1	25
Posttest #3	n = 10 Attrition = 2	n = 11 Attrition = 3	21

Table 15.2 presents means on key pretest demographic variables, measures of child functioning, measures of family functioning, and degree of hearing loss on which attrition analyses were performed. As can be seen in Table 15.1, no attrition was experienced in the TC group by the time of the first posttest, but two subjects attrited from the Oral group by that time. Attrition analysis of the Oral group at the time of the first posttest indicated a significant difference between the attrited subjects and the active subjects in unaided hearing loss. The attrited subjects had statistically significantly greater hearing losses--the parents of whom felt a TC program was more appropriate than the Oral program. This difference was no longer evident at the second and third posttests, however. At the time of the second and third posttests, attrition appeared to have resulted in a significant group by attrition status interaction regarding percent of children in daycare more than 5 hours per day. These differences were not serious since it was likely they were due to random fluctuation and because this variable is not strongly related to the most critical outcome variables of this study. A statistically significant interaction was found at the second and third posttests on the pretest Communication Total score of the Battelle. The Communication score difference found on the second and third posttests attrition analysis represents that the attrited Oral subjects, who, for the most part, attrited because parents felt their child's level of hearing loss was too great to warrant an Oral program, performed considerably lower than the others in the study. It should also be noted that this subscale on the Battelle may be biased against hearing-impaired populations and that these results maybe due to the lack of reliability established with this population. Other than these minor differences, the groups remained quite comparable on key demographic variables, and measures of child and family functioning, despite attrition.

Demographic characteristics. Table 15.3 includes the analysis of pretest demographic characteristics with those that were included at each of the testings;

Table 15.2

Attrition Analysis on Pretest Measures and Demographics

	1st Posttest						2nd Posttest											
	Oral*						Oral						Total Communication					
	Attrited			Active			Attrited			Active			Attrited			Active		
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n
Age of child in months as of 7/1/86	39.0	(31.1)	2	37.1	(15.3)	14	37.5	(19.8)	4	37.3	(16.1)	12	31.6	(11.7)	3	39.8	(14.9)	13
Percent male	1.0	(0)	2	50%	(.52)	14	50%	(.57)	4	42%	(.52)	12	67%	(.57)	3	77%	(.44)	13
Percent with both parents living at home	50%	(7)	2	100%	(.39)	14	75%	(.50)	4	83%		12	100%		3	92%	(.27)	13
Total household income	$3,250	($5,303)	2	$18,321	($11,965)	14	$16,500	($5,339)	4	$18,083	($12,938)	12	$24,000	$(6,062)	3	$12,269	($6,360)	13
Percent of children in daycare more than 5 hours per week	0%		2	21.4%	(.43)	14	0%		4	25%	(.45)	12	100%		3	30.8%	(.48)	13
Months of prior preschool	22.5	(31.8)	2	8.1	(5.9)	14	3.0	(4.2)	4	9.0	(5.9)	12	3.0	(5.2)	3	9.0	(7.3)	13
DB loss left ear	107.5	(3.5)	2	84.7	(17.1)	14	94.8	(14.9)	4	85.3	(18.5)	12	100.0	(17.3)	3	86.6	(16.4)	13
DB loss right ear	105.0	(7.1)	2	83.4	(14.6)	14	94.8	(12.5)	4	83.3	(15.9)	12	83.3	(34.0)	3	86.5	(17.7)	12
BDI DQs^																		
Communication Total	21.6	(30.6)	2	47.1	(26.8)	14	22.2	(23.3)	4	51.1	(25.7)	12	49.9	(15.2)	3	32.9	(21.6)	13
BDI Total	70.6	(7.8)	2	77.0	(17.9)	14	72.3	(16.3)	4	77.5	(17.7)	12	76.0	(17.5)	3	72.5	(15.6)	13
Reynell Raw Score*																		
Receptive	46.0	(0.0)	1	28.7	(15.3)	12	16.0		1	29.9	(15.5)	11	25.0	(14.7)	3	27.4	(13.5)	13
Expressive	29.0	(0.0)	1	18.9	(15.1)	13	1.0		1	20.4	(14.8)	12	17.0	(10.8)	3	17.1	(12.1)	13
FACES III Total# (range 1 to 54)	12.8	(14.6)	2	8.7	(6.7)	14	12.4	(11.2)	4	8.2	(6.0)	12	4.1	(2.4)	3	7.4	(3.4)	13
PSI Total (range 137 to 328)	279.5	(67.2)	2	251.4	(30.9)	14	266.5	(42.6)	4	251.1	(33.3)	12	210.6	(26.6)	3	239.5	(41.5)	13

(continued)

^ Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

* Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

** Attrition was experienced only in the oral group at the time of the first posttest, therefore analyses were conducted only in this group.

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Table 15.2 (continued)

Attrition Analysis on Pretest Measures and Demographics

	3rd Posttest											
	Oral						Total Communication					
	Attrited			Active			Attrited			Active		
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n
Age of child in months as of 7/1/86	39.0	(15.6)	6	36.4	(17.6)	10	35.0	(11.6)	5	39.7	(15.9)	11
Percent male	50%	(.55)	6	40%	(.52)	10	80%	(.45)	5	73%	(.47)	11
Percent with both parents living at home	67%	(.52)	6	90%	(.32)	10	80%	(.45)	5	100%		11
Total household income	$18,917	($14,551)	6	$16,950	($9,782)	10	$21,200	($9,391)	5	$11,409	($4,603)	11
Percent of children in care more than 5 hours per week	17%	(.41)	6	20%	(.42)	10	80%	(.45)	5	27%	(.47)	11
Months of prior preschool	3.5	(4.1)	6	10.0	(5.7)	10	6.2	(5.9)	5	8.6	(7.8)	11
DB loss left ear	91.8	(12.7)	6	85.1	(20.3)	10	94.4	(22.3)	5	86.7	(14.3)	11
DB loss right ear	92.3	(10.5)	6	82.4	(17.4)	10	84.4	(29.5)	5	86.6	(16.1)	10
BDI DQs[^]												
Communication Total	17.9	(19.8)	6	59.5	(18.2)	10	48.6	(18.4)	5	30.5	(20.7)	11
BDI Total	71.5	(13.3)	6	79.1	(18.9)	10	78.1	(17.5)	5	70.9	(14.7)	11
Reynell Raw Score[•]												
Receptive	19.7	(7.2)	3	31.8	(16.4)	9	26.2	(15.9)	5	27.3	(12.6)	11
Expressive	13.3	(12.0)	3	20.6	(16.1)	10	19.0	(13.9)	5	16.2	(10.9)	11
FACES III Total[#] (range 1 to 54)	11.5	(8.9)	6	7.9	(6.5)	10	5.3	(2.6)	5	7.4	(3.7)	11
PSI Total (range 137 to 328)	256.0		6	254.3	(35.3)	10	234.4	(37.6)	5	234.0	(42.9)	11

(continued)

[^] Statistical analysis for BDI scores were conducted using raw scores for each of the scales. For ease of interpretation, the information in this table has been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[#] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best.

[•] Reynell raw score represents the average score in each group based on a possible total of 67 for both receptive and expressive speech.

pretest, first, second and third posttests. As can be seen, subjects were predominantly Caucasian, low middle class families in largely rural areas of Arkansas. While the groups included at each of the testings were fairly comparable, several differences were found. Of the 32 subjects included in the pretesting, the TC group had statistically significantly more males than the Oral group. This difference in gender ratio was evident only between the groups included in the pretest and between the groups included in the second posttest. Also evident between the groups included in the pretesting was a difference regarding the percentage of

Table 15.3

Comparability of Groups on Pretest Demographics Variables at the Arkansas Hearing Impaired Study

	Pretest Groups							1st Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
● Age of child in months as of 7/1/87	49.4	(16.4)	16	50.3	(14.5)	16	.87	49.1	(15.3)	14	50.3	(14.5)	16	.84
● Age of mother in years	30.6	(4.3)	16	30.5	(3.7)	16	.94	31.1	(4.3)	14	30.5	(3.7)	16	.69
● Age of father in years	33.5	(4.8)	15	32.4	(5.6)	16	.57	33.9	(4.7)	13	32.4	(5.6)	16	.45
● Percent male*	44%		16	75%		16	.07	50%		14	25%		16	.17
● Years of education for mother	12.4	(2.6)	16	11.3	(2.5)	16	.25	12.6	(2.7)	14	11.3	(2.5)	16	.17
● Years of education for father	13.3	(1.9)	15	11.4	(1.8)	16	.01	13.0	(1.8)	13	11.4	(1.8)	16	.03
● Percent with both parents living at home	81%		16	94%		16	.30	86%		14	94		16	.49
● Percent of children who are Caucasian*	80%		15	93		15	.30	79%		14	93		15	.27
● Hours per week mother employed	16.6	(18.1)	16	19.4	(20.1)	16	.68	18.0	(18.8)	14	19.4	(20.1	16	.85
● Hours per week father employed	45.4	(9.7)	13	39.0	(8.9)	16	.08	45.8	(9.9)	12	39.0	(8.9)	16	.07
● Percent of mothers employed as technical managerial or above*	19%		16	13%		16	.64	21%		14	13		16	.54
● Percent of fathers employed as technical managerial or above*	54%		13	13%		16	.02	50%		12	13%		16	.04
● Total household income^	$17,688	($11,556)	16	$14,469	($7,721)	16	.36	$18,321	($11,966)	14	$14,469	($7,721)	16	.31
● Percent with mother as primary caregiver*	88%		16	100%		16	.16	93%	(.3)	14	100%		16	.34
● Percent of children in in daycare more than 5 hours per day*	19%		16	44%		16	.14	21%		14	44%		16	.20
● Number of siblings	1.1	(1.1)	16	.8	(.6)	16	.31	1.0	(1.1)	14	.8	(.6)	16	.46
● Percent with English as primary language	93%		15	100%		16	.33	92%		13	100%		16	.34
● Months of prior preschool	9.1	(11.1)	16	7.8	(7.2)	16	.54	8.1	(5.90	14	7.8	(7.2)	16	.91

(continued)

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* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

^ Means and standard deviations for this variable were estimated from categorical data.

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Table 15.3 (continued)

Comparability of Groups on Pretest Demographics Variables at the Arkansas Hearing Impaired Study

	2nd Posttest Groups							3rd Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p value
● Age of child in months as of 7/1/87	49.3	(16.1)	12	51.7	(14.9)	13	.69	48.4	(17.5)	10	51.8	(15.2)	12	.64
● Age of mother in years	31.4	(4.6)	12	29.8	(3.4)	13	.35	32.2	(4.5)	10	29.6	(3.7)	11	.16
● Age of father in years	33.9	(4.8)	11	32.1	(6.1)	13	.83	35.1	(4.4)	9	31.7	(6.5)	11	.19
● Percent male[*]	42%		12	77%		13	.08	60%		10	27%		11	.15
● Years of education for mother	12.5	(2.7)	12	10.8	(2.3)	13	.12	12.7	(2.6)	10	10.5	(2.4)	11	.07
● Years of education for father	13.2	(1.9)	11	11.3	(1.7)	13	.02	13.4	(2.1)	9	11.0	(1.7)	11	.01
● Percent with both parents living at home	83%		12	92%		13	.52	90%		10	100%		12	.34
● Percent of children who are Caucasian[*]	83%		12	92%		12	.56	100%		10	90%		11	.34
● Hours per week mother employed	18.5	(19.4)	12	17.7	(19.9)	13	.92	18.2	(19.2)	10	17.3	(19.9)	11	.92
● Hours per week father employed	44.0	(9.6)	10	38.7	(9.9)	13	.22	42.2	(8.3)	9	36.7	(8.4)	11	.16
● Percent of mothers employed as technical managerial or above[*]	8%		12	8%		13	.95	10%		10	8%		12	.89
● Percent of fathers employed as technical managerial or above[*]	50%		10	15%		13	.09	56%		9	8%		12	.03
● Total household income[~]	$18,085	($12,938)	12	$12,269	($6,359)	13	.18	$16,950	($9,782)	10	$11,809	($8,603)	11	.13
● Percent with mother as primary caregiver[*]	92%		12	100%		13	.34	90%		10	100%		12	.34
● Percent of children in in daycare more than 5 hours per day[*]	25%		12	31%		13	.76	20%		10	33%		12	.50
● Number of siblings	1.0	(1.1)	12	.8	(.6)	13	.54	1.0	(1.1)	10	.6	(.5)	11	.37
● Percent with English as primary language	91%		11	100%		13	.34	90%		10	100%		12	.34
● Months of prior preschool	9.0	(5.9)	12	9.0	(7.3)	13	1.00	10.0	(5.7)	10	7.9	(7.9)	12	.49

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scored "0."

[~] Means and standard deviations for this variable were estimated from categorical data.

fathers employed as technical/managerial or above with the Oral group reporting a significantly higher percentage than the TC group. This difference was no longer evident in subsequent years. A difference was found between the subjects included in the pretest and those included in the first posttest on the number of hours fathers were employed; the Oral group reported a significantly greater number of hours than the TC group. This difference was not evident between the groups included in the second and third posttests. Another difference was found between the treatment group at each of the four testings regarding the years of education of the father. The Oral group reported significantly more years of education for the father than the TC group. This difference remained evident between the groups at each of the subsequent testings. Variables on which differences were found were considered for use as covariates in appropriate posttest analyses. Overall, however, the two groups were very comparable at pretest. Given the number of variables which were considered and the fact that the differences associated with developmental areas did not consistently favor one group, any slight differences between groups that were identified were likely the result of sampling fluctuation.

Intervention Programs

As indicated above, all children received half-day center-based services at least two days each week, and home intervention using the SKI*HI curriculum. Children in both groups received audiological services, appropriate hearing aids were selected, and training in their proper use was provided to teachers and parents.

Individualized Education Plans (IEPs) were written for each child at program entry, and at the end of each academic year. Audiological, speech and language, psychological, and other assessments (e.g., occupational and physical therapy) were completed and used in initial IEP development. The Texas Language Curriculum Roadmap was used during the school year as the basis for future IEP development and refinement. Audiological assessment was also conducted regularly, and comprehensive assessments, including all of the above components, were conducted every three years. For purposes of description, the intervention can be divided into those services which were center-based, and those that were home-based.

Center-based Program. Classroom activities were designed to promote expressive and receptive language skills of all children, including word usage and concept development. Teachers administered the Ling Articulation Index to assess children's Oral development and followed up with the Texas Language Curriculum for general programming guidelines. Objectives for IEPs were selected based on these instruments. A cognitively oriented approach to instruction that maximizes learning opportunities via structured and unstructured activities was used in the classroom. Structured activities were designed to match child interests and were presented via lesson plans that addressed specific objectives for each child. Using this child directed rather than teacher directed approach, activities could vary from the original plan if the children demonstrated interest in related but unanticipated areas. For example, in a travel activity that was designed to take place in a pretend car, if a child decided that his car had wings and could fly, the activity could be redirected toward air travel.

A typical schedule for a classroom day is presented below (all activities listed are in fact language activities, although only one is specifically called a "language activity):

9:00 - 9:20 AM: Group discussion of today's weather.

9:20 - 9:50 AM: Auditory training time. Children take turns listening to the teacher with their backs to her as she makes various sounds. The child listening raises her/his hand when the sound is heard.

9:50 - 10:10 AM: Free choice activity time. Children choose a play area in which they are interested (e.g. kitchen, chalk board, toy box), and interact with the teacher and other children in that setting.

10:10 - 10:30 AM: Snack time. Milk and cookies are provided, and children must vocalize or sign, as appropriate, to indicate what they want. Children are also given the opportunity to practice kitchen skills, such as pouring, measuring, etc.

10:30 - 11:00 AM: Language activity. Children will play "housekeeper" today, using naturally occurring opportunities to communicate their wants, needs, plans, and actions to the teacher and to each other.

11:00 - 11:30 AM: Gross motor activity. Children will play "leap frog" and "London Bridge" to develop both their motor skills and their listening/attending skills.

11:30 - 11:50 AM: Clean-up and plan time. Children will help clean the classroom by putting toys away, etc. Plans for tomorrow's activities will be discussed, and the children's comments will be used as appropriate to modify the teacher's plan.

11:50 - 12:00 PM: Prepare to leave and departure.

Home visits. The SKI*HI curriculum (Clark, 1985) was designed for use in the homes of preschoolers with hearing impairments. It provided training for parents in management of a child with a hearing impairment, hearing aid care and maintenance, language development activities (using the same mode of communication used in the classroom), and child management. Home visits were conducted by the child's center-based teacher to ensure consistency and generalization from school to home. The home visitors monitored child development and progress as well as parent skills and needs to facilitate appropriate home programming. The equivalent of an IEP was developed for this purpose. Home visits were initially made three times a month, and tapered off as the family gained the skills and confidence to handle the daily concerns of their child with a hearing impairment, as well as the concerns of the family.

During the second and third years of the project, Oral and TC classes were conducted by each teacher on different days of the week or at different times of day, such that treatment groups were separated at all times and the same teacher provided service to both groups. Classroom dividers were used during the first year, and although groups were kept separate in this manner, the teachers suggested that children be taught at separate times to improve both the quality of their instruction and their ability to teach in the appropriate mode (i.e., Oral or TC).

Differences between oral and TC programs. The Oral group was instructed using Oral intervention techniques including auditory training and development of Oral skills. Auditory training requires the child to respond to sound when the sound source is out of sight, as in the sample daily schedule below, and the Oral procedures require the child to vocalize all communications.

The TC group was trained using a comprehensive communication program that promotes the use of Oral/aural skills (by encouraging vocalization and using the same auditory training used with the Oral group) but encouraged the use of Signed Exact English II (SEE II) and other gestures as needed for communication. Parents in the TC group were trained in SEE II as part of their SKI-HI program and were encouraged to use sign language with their child.

Treatment Verification

A number of procedures were used to verify that treatment were implemented as intended. They are described below.

Collection of attendance data. The child's participation in the program was recorded according to the days of attendance at the center-based program. Attendance rates across the three years was comparable between the two groups (mean attendance for the oral group was 75.7% while the mean attendance for TC group was 78.6%).

Teacher evaluations. The preschool supervisor evaluated teachers on a 3-point scale (3 = criteria fully met; 2 = partially met; 1 = not met) that assessed the following: teacher assessment skills; IEP development skills; IEP implementation skills; presentation of instruction; and instructional environment. Average ratings by teacher were 3.0, 2.58, 2.9, 2.71, and 3.0. Additionally, teachers were ranked in quartiles (i.e., top 25%, top 50%, bottom 50%, and bottom 25%) relative to other teachers the supervisor has worked with. Two teachers were ranked in the top 25%, two in the top 50%, and one in the bottom 50%. Since teachers taught children in both groups, it is unlikely that the quality of teacher could have confounded the findings of the study with regard to Oral vs. TC. These data suggest that the preschool teachers at ASD were performing their duties as well as or better than other teachers in comparable settings.

Child health and additional services. Ratings of child's health were collected from each child's parent at the time of each testing and indicated no statistically significant differences on any in any of the health related areas. The two treatment groups were also comparable with respect to the amount of additional services received beyond that provide by the intervention program. The main areas in which additional services were provided were speech therapy (an overall mean of 45.6 hours during the year for all subjects in the study) and daycare (an overall mean of 213 hours during the year).

Site review. Formal site reviews were conducted in April 1987, April 1988, and March 1989. While treatment differences were found to be adequate during the first year, the shift to alternating the times at which the groups were present for instruction had the desired impact of further emphasizing those differences. Specifically, teachers were less likely to use sign with the Oral group when that group was in class and the TC group was not. Dr. Roberto Gonzales of the University of Northern Colorado, an independent reviewer who viewed classroom videotapes from the 1987-1988 school year, reported that the quality of instruction for both groups was good and that clear communication mode differences were present and was the only difference between the groups.

Otherwise, the ASD program was judged to be in full or nearly full compliance with EIRI site review quality criteria. IEP development and lesson planning were good, with all IEP criteria being met or nearly met by all teachers. Teaching quality was found to be very good in both communication modes by the EIRI and ASD reviewers, as well as by the independent reviewer. Overall, the preschool program was considered to be of high quality as compared to other TC and oral/aural programs with similar philosophical orientations.

Use of communication mode at home. At the time of the third posttest, parents were asked about their use of communication modes at home. Out of the 9 children for whom data were collected in the Oral group, 7 spent the majority of their time away from school using Oral communication, although 4 of these reported using TC some of the time. Parents of 1 of the 9 children in the Oral group reported using TC the majority of the time, while 1 other parent reported using Oral half of the time and TC the other half.

Out of the 11 children in the TC group, 4 of the parents reported using TC the majority of the time, although 2 of these four reported using Oral some of the time. A total of 5 of the 11 children's parents reported that they used Oral and TC equally at home. Finally, 2 of the children in the TC group reported using Oral the majority of the time. It is not surprising that parents in the TC group relied on oral communication fairly frequently since sign language can often be difficult for most parents to learn.

Cost of alternative interventions. Program costs were calculated using the ingredients approach. The ingredients approach is a systematic, well-tested procedure for identifying all of the social costs for implementing alternative programs, including costs that are often omitted from cost analysis such as contributed (in-kind) and shared resources. In this approach, an exhaustive list of resources used by each alternative is developed, and the ingredients are costed according to observed market values (e.g., salaries) or opportunity cost (e.g., parent time). An opportunity cost is the value of a resource in its next best alternative use. For example, parents participating in intervention activities could have been engaged in other productive activities; these foregone activities represent a cost to parents. Since we have no information about any one individual's opportunity costs, we estimated the value of an individual's time based on national data. The amount of parent or non-parent volunteer time required for the study was assigned the pecuniary value of $9 per hour based on the "median usual weekly earning for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989).

All costs are in 1990 dollars. In cases where program costs were compared over several years, costs were adjusted for inflation using the Fixed Weighted Price Index for state and local government purchases (Bureau of Economic Analysis, 1988). In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Because the only difference between groups in this study was the mode of communication used, between group cost differences were neither expected nor found. All costs were thus averaged across all children in the study. Total cost per child in 1990 dollars averaged $4,298 for school services only, and $6,413 when the cost of parent-provided time and transportation were included. Costs of direct service (teachers, aides, supervisor, and consultants) were or over 70% of the school services cost and 45% of the total cost with parent transportation. Parent transportation costs included both mileage and traveling time. Adjustments were made for parents who car-pooled. All cost data in Table 15.4 were adjusted for inflation to 1990 dollars. In addition, at the bottom of Table 15.4, the figures are discounted at 3% and 5%.

Data Collection

Data on all participants were collected at the time of group assignment and annually thereafter, as summarized below.

Recruitment, training, and monitoring of diagnosticians. Three local diagnosticians and an assessment supervisor were trained by EIRI staff to administer the standard pretest and posttest measures. Professors at local universities and professionals in local social service agencies were asked if they or others they knew

Table 15.4

Cost Per Child for Arkansas School for the Deaf (1990 Dollars)

Resources	Cost Per Child
1. UNDISCOUNTED	
Agency Costs	
Direct Service	$2,679
Administrative	312
Occupancy	880
Equipment	79
Travel	301
Materials/Supplies	19
Miscellaneous	28
SUBTOTAL	**$4,298**
Contributed Resources	
Parent Time	126
Child Transportation	2,067
Equipment	22
SUBTOTAL	**$2,215**
TOTAL	***$6,513***
2. DISCOUNTED (3%)	
Subtotal	$4,695
Total	7,115
3. DISCOUNTED (5%)	
Subtotal	$4,974
Total	7,537

* *Totals may not add up due to rounding errors.*

were willing to do testing. One graduate student and three professionals at a local rehabilitation program were trained in administration of the Battelle Developmental Inventory (BDI). The most experienced professional was identified as an assessment coordinator. All diagnosticians viewed videotapes of administration procedures for the Battelle Developmental Inventory (BDI), reviewed the BDI administration manual, and completed a self-test of BDI procedures before attending a two-day training session. The training session addressed all facets of the BDI, and included a competency test. Finally, persons who completed the training completed three practice tests, one of which was both shadow scored and videotaped by the coordinator. The videotape was sent to EIRI for review, and an interrater agreement of .85 was required before certification as a diagnostician.

The supervisor and two of the diagnosticians held Ph.D.s and the other had a master's degree. Student diagnosticians who administered the complementary measures were selected by the faculty of the Department of Speech and Language Pathology at the University of Central Arkansas (UCA) based on completion of a specified set of courses in speech pathology. All diagnosticians were proficient in sign language. Student testers from UCA were trained in sign language and had access to the teacher during testing, such that optimal communication with the child was maintained. Each diagnostician tests approximately the same number of children in each group. Testing was scheduled by the local coordinator in cooperation with the assessment supervisor, who shadow scored 10% of the test administrations. Shadow scored tests indicated an average of 93.3% agreement, with a range of 91% to 96%. Agreement was calculated by dividing the number of exact agreements in scoring items administered by the total number of items administered. Exact agreement meant that both raters scored an item '0,' '1,' or '2.'

Pretest. The pretest battery consisting of the Battelle Developmental Inventory (BDI), the Parenting Stress Index (PSI), Family Support Scale (FSS), Family Resource Scale (FRS), Family Inventory of Life Events (FILE), and the Family Adaptability and Cohesion Evaluation Scales (FACES) was administered to 32 children and families. Families were given a $20 incentive for their participation in pretesting. Testing was conducted by one of the diagnosticians, each of whom is a fluent signer and unaware of the child's group assignment. Mode of administration for the BDI (i.e., Oral vs. TC) was determined by the examiner after a period of interaction with the child and family, and was noted on the test protocol. Testing occurred in rooms provided at the preschool site where the child attended class. Mothers completed the family measures following administration of the BDI, and fathers (when possible) completed the Family Support Scale only. If the father or other male was present in the home but was not at the testing session, the parent was given a copy of the Family Support Scale to take home for him/her to complete. The diagnosticians completed testing reports and transmitted all data to the assessment supervisor, who checked the scoring accuracy and forwarded the protocols to EIRI via certified mail.

Posttest #1. The first round of posttesting occurred during April and May, 1987 for children enrolled during the 1986-87 academic year, and in April and May, 1988 for those who were not enrolled until the 1987-88 academic year, allowing five to six months of intervention between pre- and posttesting. The posttest battery was administered in two sessions, as described below.

The first session was conducted by graduate practicum students from the department of speech pathology at the University of Central Arkansas (UCA). Tests administered at this time were the Receptive and Expressive Language sections of the Reynell Developmental Language Scales. Each of these measures was administered by the same student to all children. That is, one student did all the Reynell Receptives, another all the Reynell Expressives, etc. Because of the nature of these tests and the experimental comparison (Oral vs. TC), these diagnosticians knew the mode of communication used by the child, but were unaware of the purpose of the study. Tests were administered in the mode appropriate to the child's group. The graduate students were supervised by faculty from UCA.

The second session was administered by the same set of naive diagnosticians, but not necessarily the same diagnostician, who administered the pretests. In addition to the instruments used at pretest, mothers completed the Parent Survey Form, the Parent Report of Child's Health, the Additional Services Form, and the Parent Satisfaction with Services Form; teachers completed the Meadow-Kendall on each child in their classroom. Parents were paid a $30 incentive for testing.

Posttest #2. The second round of posttest data collection was conducted from April through June, 1988. The procedures used and measures included were the same as those employed in the first posttest session.

Posttest #3. Posttest #3 included all of the measures used in Posttest #2 with the additional of a parent survey intended to elicit attitudes about their child's experience in the intervention program. Additionally, a measure was used to determine the extent to which children were using their assigned mode of communication outside of intervention and to determine parents attitudes toward the communication mode being used. The latter addition included a semantic attitude checklist developed by the project on which parents indicated how much of the time their communication with their child was, for example, "productive." Other words on which parent were asked to rate their communication included, for example: frustrating, rewarding, confusing, comfortable, relaxed, business-like, interactive, fun, natural, etc.

Results and Discussion

The following section will present the results of the study with respect to the following research questions:

1. To what extent are the two treatment groups comparable on pretest measures of child and parent functioning?
2. To what extent are there differences between the treatment groups on measures of child functioning at first, second, and third posttests?
3. To what extent are there differences between the treatment groups on measures of family functioning at first, second, and third posttests?
4. What is the relationship between the costs and effects of each treatment?

Comparability of Groups at Pretest

Pretest results from the measures of child functioning are summarized in Table 15.5 and includes the analysis of pretest scores for subjects that were included at each of the testings; pretest, first, second and third posttests. As can be seen, the two treatment groups demonstrated comparable abilities on the pretest measures of child functioning. While it is possible that attrition would have caused the comparability of the groups to be negatively changed across the subsequent three years of the study, this was not the case until the third posttest. The attrition

Table 15.5

Comparability of Groups on Pretest Measures

	Pretest Groups							1st Posttest Groups						
	Oral Communication			Total Communication				Oral Communication			Total Communication			
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
● Age of child in months as of 7/1/86	37.4	(16.4)	16	38.3	(14.5)	16	.87	37.1	(15.3)	14	38.3	(14.5)	16	.84
● Battelle Developmental Inventory (BDI)														
Personal/Social	88.4	(32.1)	16	87.3	(26.8)	16	.70	88.3	(34.1)	14	87.3	(26.8)	16	.67
Adaptive Behavior	87.8	(19.6)	16	84.3	(17.9)	16	.94	89.1	(20.6)	14	84.3	(17.9)	16	.85
Gross Motor	89.9	(21.6)	16	81.9	(21.5)	16	.85	89.1	(22.6)	14	81.9	(21.5)	16	.92
Fine Motor	93.6	(15.8)	16	89.2	(15.0)	16	.96	91.8	(16.1)	14	89.2	(15.0)	16	.87
Motor Total	90.2	(16.0)	16	83.7	(17.1)	16	.90	89.2	(16.7)	14	83.7	(17.1)	16	.98
Expressive Comm.	46.9	(27.6)	16	38.2	(21.4)	16	.78	49.9	(27.1)	14	38.2	(21.4)	16	.70
Receptive Com..	41.8	(27.9)	16	35.3	(24.1)	16	.67	44.9	(27.4)	14	35.3	(24.1)	16	.53
Communication Total	43.9	(27.6)	16	36.2	(21.2)	16	.72	47.1	(26.8)	14	36.2	(21.2)	16	.61
Cognitive	69.6	(24.5)	16	70.3	(19.1)	16	.85	71.6	(25.6)	14	70.3	(19.1)	16	.87
TOTAL	76.2	(16.9)	16	73.2	(15.4)	16	.96	77.0	(17.9)	14	73.2	(15.4)	16	.96
● Raynell Raw Score														
Receptive	30.1	(15.4)	13	26.9	(13.2)	16	.56	28.8	(15.3)	12	26.9	(13.2)	16	.74
Expressive	19.6	(14.7)	14	17.1	(11.5)	16	.59	18.9	(15.1)	13	17.1	(11.5)	16	.71
DB loss left ear	87.6	(17.7)	16	89.1	(16.8)	16	.81	84.7	(17.1)	14	89.1	(16.8)	16	.49
DB loss right ear	86.1	(15.6)	16	85.8	(20.4)	16	.97	83.4	(14.6)	14	85.8	(20.4)	15	.72
DB loss w/hearing aid	40.1	(17.2)	15	48.6	(17.4)	13	.20	35.8	(13.2)	13	48.6	(17.4)	13	.05
	2nd Posttest Groups							**3rd Posttest Groups**						
● Age of child in months as of 7/1/86	37.3	(16.1)	12	39.8	(14.9)	13	.69	36.4	(17.5)	10	39.8	(15.2)	12	.64
● Battelle Developmental Inventory (BDI)														
Personal/Social	88.0	(35.2)	12	86.1	(29.1)	13	.69	87.3	(38.8)	10	84.9	(29.5)	11	.63
Adaptive Behavior	88.1	(21.3)	12	84.0	(19.4)	13	.96	86.1	(22.9)	10	83.0	(20.9)	11	.94
Gross Motor	90.6	(23.8)	12	82.0	(22.3)	13	.94	89.4	(22.2)	10	80.5	(22.1)	11	.96
Fine Motor	92.1	(15.9)	12	90.4	(16.5)	13	.83	91.6	(17.1)	10	89.8	(17.9)	11	.83
Motor Total	90.1	(17.2)	12	85.5	(16.0)	13	.96	89.1	(17.1)	10	84.6	(16.6)	11	.95
Expressive Comm.	53.5	(26.1)	12	36.1	(23.1)	13	.47	60.3	(22.7)	10	31.2	(19.7)	11	.10
Receptive Comm.	49.8	(26.5)	12	30.8	(21.9)	13	.28	58.9	(17.2)	10	31.8	(21.1)	11	.08
Communication Total	51.1	(25.7)	12	32.9	(21.6)	13	.37	59.5	(18.2)	10	30.5	(20.7)	11	.08
Cognitive	71.6	(26.7)	12	71.2	(20.5)	13	.85	76.9	(25.2)	10	68.5	(18.9)	11	.63
TOTAL	77.5	(17.7)	12	72.5	(15.6)	13	.99	79.1	(18.9)	10	70.9	(14.7)	11	.86
● Raynell Raw Score														
Receptive	29.9	(15.5)	11	27.4	(13.5)	13	.67	31.8	(16.4)	9	27.8	(12.2)	12	.53
Expressive	20.4	(14.7)	12	17.1	(12.1)	13	.54	20.6	(16.1)	10	17.0	(10.8)	12	.54
DB loss left ear	85.3	(18.5)	12	86.6	(16.4)	13	.85	85.1	(20.3)	10	86.2	(13.8)	12	.88
DB loss right ear	83.3	(15.9)	12	86.5	(17.8)	12	.64	82.4	(17.4)	10	87.4	(15.5)	11	.49
DB loss w/hearing aid	38.4	(9.8)	12	46.5	(18.1)	11	.19	38.9	(9.9)	10	49.1	(18.6)	11	.14

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which had accrued by the time of the third test resulted in a statistically significant pretest difference between the groups in the communication domain of the Battelle--the Oral group scoring significantly higher than the TC group. Thus, the communication domain score on the Battelle was used as covariate in third posttest analysis.

Regarding measures of family functioning, the groups appeared to be fairly comparable on pretest measures over the course of the four testings (see Table 15.6). The "other-related" score on the PSI was also identified as covariate to be used in posttest analyses, since a statistically significant difference was found between the groups in each year's analysis. Additionally, a statistically significant difference ($p = .09$) was found on the FILE at pretest in favor of the TC group.

Posttest Measures of Child Functioning

Table 15.7 summarizes the results of posttest analyses on the measures of child functioning. As can be seen, no statistically significant differences were found on the Battelle at the first, second, or third posttests with exception of a small difference found at the third posttest on the Fine Motor domain. No differences were found on the Reynell at any of the posttests indicating that neither mode of communication used as a part of early intervention was superior with regard to its effect on receptive and/or expressive language development. Further, no significant differences were found on the main scales of the Meadow-Kendall at any of the posttests with the exception of a difference on the sociable, communicative behavior scales at the second posttest. In this case, the Total Communication group scored significantly higher than the oral group suggesting, perhaps, that the children in this group had greater early success in communicating socially and that the use of total communication had facilitated this behavior more so than did the oral communication mode. It is more likely, however, that these differences were due to random fluctuation in light of the relatively large number of measures examined.

Table 15.6

Comparability of Groups of Pretest Measures

Variable	Oral Communication			Total Communication			p Value	Oral Communication			Total Communication			p Value
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n		$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	
	Children Participating in Pretest							**Children Participating in Posttest #1**						
● Parenting Stress Index (PSI) Percentile Rank														
Total (range 137 to 328)	254.9	(35.0)	16	234.1	(40.1)	16	.13	251.4	(30.9)	14	234.1	(40.1)	16	.19
Child Related (range 50 to 235)	114.6	(17.7)	16	111.3	(23.2)	16	.65	110.9	(12.3)	14	111.3	(23.2)	16	.95
Other Related (range 74 to 200)	140.3	(27.8)	16	122.8	(19.5)	16	.05	140.5	(28.4)	14	122.8	(19.5)	16	.06
● Family Support Scale (FSS)	26.0	(10.8)	16	27.2	(8.4)	16	.73	25.0	(10.6)	14	27.2	(8.4)	14	.55
● Family Resource Scale (FRS)	118.8	(23.8)	16	122.9	(18.1)	16	.59	122.4	(22.8)	14	122.9	(18.1)	16	.95
● Family Index of Life Events (FILE)	12.0	(6.8)	16	8.3	(5.5)	16	.09	11.1	(6.1)	14	8.3	(5.5)	16	.19
● Family Adaptation and Cohesion Evaluation Scales (FACES III)														
Cohesion (range 0 to 30)	6.2	(7.5)	16	3.6	(3.0)	16	.22	5.5	(6.8)	14	3.6	(3.0)	16	.37
Adaptation (range 0 to 24)	5.3	(4.3)	16	4.6	(3.8)	16	.66	5.3	(4.3)	14	4.7	(3.8)	16	.69
TOTAL (range 1 to 54)	9.2	(7.4)	16	6.8	(3.5)	16	.24	8.7	(6.7)	14	6.8	(3.5)	16	.34
	Children Participating in Posttest #2							**Children Participating in Posttest #3**						
● Parenting Stress Index (PSI) Percentile Rank														
Total (range 137 to 328)	251.1	(33.3)	12	239.5	(41.5)	13	.45	254.3	(35.3)	10	229.8	(43.5)	12	.16
Child Related (range 50 to 235)	109.6	(12.8)	12	114.7	(23.7)	13	.50	110.3	(13.9)	10	109.5	(24.6)	12	.93
Other Related (range 74 to 200)	141.5	(30.5)	12	124.7	(20.4)	13	.13	144.0	(32.3)	10	120.3	(21.6)	12	.06
● Family Support Scale (FSS)	24.3	(10.8)	12	25.1	(4.9)	11	.83	23.3	(11.3)	10	26.7	(9.8)	10	.48
● Family Resource Scale (FRS)	124.6	(23.6)	12	121.6	(19.7)	13	.73	126.2	(23.9)	10	123.1	(19.9)	12	.75
● Family Index of Life Events (FILE)	9.9	(5.8)	12	9.2	(5.7)	13	.74	10.7	(6.1)	10	7.6	(3.5)	12	.17
● Family Adaptation and Cohesion Evaluation Scales (FACES III)														
Cohesion (range 0 to 30)	4.5	(5.6)	12	3.8	(3.2)	13	.73	5.0	(6.1)	10	3.8	(3.4)	12	.59
Adaptation (range 0 to 24)	5.7	(4.4)	12	5.3	(3.8)	13	.78	4.9	(4.3)	10	4.8	(4.2)	12	.93
TOTAL (range 1 to 54)	8.2	(6.0)	12	7.4	(3.4)	13	.68	7.8	(6.5)	10	7.2	(3.6)	12	.79

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Table 15.7

Summary of ANCOVA's on Measures of Child Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
POSTTEST #1												
Age of Child at time of test		48.0	(14.6)		14	49.6	(13.9)		16	.10	.76	.11
BDI +												
Personal/Social DQ	5,6,10,11	82.4	(26.2)	77.8	12	70.6	(19.9)	75.2	16	.04	.84	-.06
Adaptive Behavior DQ	5,6,10,11	85.6	(21.1)	82.5	12	79.3	(17.4)	83.4	16	.12	.73	.05
Gross Motor DQ	5,6,10,11	82.5	(17.4)	80.8	12	83.9	(24.1)	85.6	16	.03	.86	.23
Fine Motor DQ	5,6,10,11	91.5	(13.5)	88.7	12	86.1	(14.6)	88.8	16	.25	.62	.01
Motor Total DQ	5,6,10,11	86.2	(14.6)	83.8	12	84.7	(15.7)	87.2	16	.01	.90	.22
Expressive Comm. DQ	5,6,10,11	51.7	(16.9)	48.2	12	44.1	(17.7)	47.6	16	.01	.94	-.03
Receptive Comm. DQ	5,6,10,11	50.7	(20.7)	49.7	12	41.4	(15.9)	42.4	16	.28	.60	-.41
Communication Total DQ	5,6,10,11	50.6	(16.6)	47.9	12	42.8	(17.2)	45.4	16	.03	.87	-.15
Cognitive Total DQ	5,6,10,11	66.7	(18.1)	62.6	12	63.1	(16.4)	67.2	16	.07	.79	.27
BDI Total DQ	5,6,10,11	73.8	(14.7)	69.9	12	67.1	(13.5)	71.0	16	.01	.91	.08
Reynell Raw Score												
Receptive	1,2	28.7	(15.3)	28.8	12	26.9	(13.2)	26.8	16	.17	.68	-.14
Expressive	3	18.9	(15.1)	17.7	13	17.1	(11.5)	18.3	16	.01	.90	.05
Meadow-Kendall												
Sociable/Comm. Behavior	4,5	342.6	(55.5)	339.2	13	335.6	(41.5)	339.0	16	.00	.99	.00
Impulsive Behavior	6,7	305.5	(57.5)	298.8	13	297.3	(57.3)	308.8	16	.06	.81	.17
Developmental Lags	8	345.7	(43.9)	341.0	13	325.9	(59.7)	330.5	16	.27	.61	-.20
Anxious Compulsive Beh.	6,9	311.6	(55.5)	314.3	13	330.9	(48.4)	328.2	16	.48	.49	.27
POSTTEST #2												
Age of Child at time of test		63.5	(11.2)		11	62.4	(13.4)		13			-.09
BDI +												
Personal/Social DQ	3,6,10,11	81.8	(17.6)	78.2	10	78.9	(21.1)	82.6	13	.24	.63	.22
Adaptive Behavior DQ	3,6,10,11	88.7	(14.1)	82.6	10	77.6	(19.9)	83.7	13	.09	.77	.06
Gross Motor DQ	3,6,10,11	86.8	(18.7)	81.4	10	80.6	(28.0)	86.1	13	.07	.79	.20
Fine Motor DQ	3,6,10,11	93.9	(9.4)	87.6	10	86.2	(22.1)	92.7	13	.16	.69	.31
Motor Total DQ	3,6,10,11	90.4	(9.5)	84.8	10	83.2	(22.2)	88.8	13	.33	.57	.24
Expressive Comm. DQ	3,6,10,11	47.3	(14.6)	42.9	10	39.3	(13.1)	43.6	13	.18	.68	.05
Receptive Comm. DQ	3,6,10,11	50.7	(16.5)	47.1	10	37.0	(15.2)	40.6	13	1.27	.27	-.41
Communication Total DQ	3,6,10,11	48.5	(13.9)	44.5	10	38.6	(12.8)	42.6	13	.60	.45	-.14
Cognitive Total DQ	3,6,10,11	74.1	(19.8)	66.4	10	64.5	(18.1)	72.2	13	.01	.93	.31
BDI Total DQ	3,6,10,11	75.3	(11.3)	69.9	10	67.4	(16.4)	72.8	13	.28	.60	.20
Reynell Raw Score												
Receptive	1,2	34.1	(12.5)	32.6	11	32.7	(15.1)	34.2	13	.09	.76	.11
Expressive	1,2,3	38.5	(15.4)	34.6	10	32.7	(13.5)	36.6	13	.10	.75	.14
Meadow-Kendall												
Sociable/Comm. Behavior	4,5,6	314.8	(58.2)	311.0	11	345.0	(25.3)	348.8	13	5.91	.03	.94
Impulsive Behavior	7	307.5	(45.6)	307.5	11	323.9	(40.1)	323.9	11	.82	.37	.38
Developmental Lags	6,8,2	361.4	(28.5)	360.4	11	358.2	(32.8)	359.2	13	.01	.92	-.04
Anxious Compulsive Beh.	9	340.5	(69.8)	330.5	11	348.6	(40.0)	358.6	13	1.55	.23	.52

(continued)

* Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

+ Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

^ $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$$

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Table 15.7 (continued)

Summary of ANCOVA's on Measures of Child Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates[*]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES[^]
POSTTEST #3												
Age of Child at time of test		72.4	(17.5)		10	75.1	(11.5)		12	.19	.67	.19
BDI[']												
Personal/Social DQ	9,10,11,12	90.9	(12.1)	82.0	8	77.3	(19.9)	86.3	11	2.99	.11	.26
Adaptive Behavior DQ	9,10,11,12	91.6	(12.1)	81.0	8	77.9	(25.2)	88.6	11	1.05	.33	.38
Gross Motor DQ	9,10,11,12	97.8	(16.9)	87.6	8	81.9	(27.2)	92.1	11	.84	.37	.20
Fine Motor DQ	9,10,11,12	91.7	(12.1)	81.5	8	94.7	(31.5)	104.9	11	3.32	.09	1.00
Motor Total DQ	9,10,11,12	92.7	(12.5)	81.7	8	87.3	(25.6)	98.2	11	2.11	.17	.82
Expressive Comm. DQ	9,10,11,12	59.9	(25.9)	56.6	8	39.5	(14.5)	42.8	11	.38	.55	-.72
Receptive Comm. DQ	9,10,11,12	58.3	(24.1)	54.7	8	41.6	(15.7)	45.1	11	.09	.74	-.50
Communication Total DQ	9,10,11,12	57.6	(22.0)	54.0	8	40.4	(14.5)	44.0	11	.23	.64	-.57
Cognitive Total DQ	9,10,11,12	73.9	(22.9)	63.8	8	62.8	(14.3)	72.9	11	.27	.61	.51
BDI Total DQ	9,10,11,12	80.0	(12.9)	72.2	8	67.1	(17.3)	74.9	11	.70	.42	.17
Reynell Raw Score												
Receptive	1,2	40.6	(15.3)	41.1	9	44.6	(7.9)	44.1	10	.27	.61	.26
Expressive	3,4,5	43.5	(16.9)	34.3	8	33.3	(12.0)	42.5	10	.76	.40	.58
Meadow-Kendall												
Sociable/Comm. Behavior	6,7	352.5	(33.9)	351.8	9	352.4	(29.2)	353.1	11	.01	.92	.04
Impulsive Behavior	8	322.3	(40.5)	324.3	9	325.9	(50.8	323.9	11	.00	.98	.01
Developmental Lags	9,4	374.1	(27.8)	372.2	9	368.1	(36.8)	370.0	11	.02	.88	-.07
Anxious Compulsive Beh.	3	334.5	(53.2)	321.1	8	334.8	(31.9)	348.2	11	1.80	.19	.67

[*] Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

['] Developmental Quotient (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

[^] $$\text{ES} = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$$

Posttest Measures of Family Functioning

Table 15.8 summarizes the results of posttest analyses on the measures of family functioning. As can be noticed, no statistically significant differences were found on any of the measures of family functioning at any of the three posttests with the exception of a difference found on the second posttest FACES III total scores. In this case, the TC group, although not significantly less healthy than the oral group on either of the subscales, scored statistically significantly less healthy than the Oral group on the total score. Given the large number of variables tested and the fact that the average effect size across all measures was so close to zero, this difference is likely due random fluctuation.

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Table 15.8

Summary of ANCOVA's on Measures of Family Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates[*]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES[^]
POSTTEST #1												
Parenting Stress Index												
Child Related (range 50 to 235)	1	112.9	(13.9)	111.4	13	111.3	(15.5)	112.7	16	.05	.89	-.09
Other Related (range 74 to 200)	1	126.6	(21.6)	124.6	13	123.8	(17.9)	25.8	16	.03	.87	-.06
Total (range 137 to 328)	1	239.5	(33.6)	236.0	13	235.1	(28.1)	238.5	16	.05	.83	-.08
FACES III[**]												
Adaptation (range 0 to 24)	2,3,4	3.8	(3.8)	3.7	13	6.5	(3.5)	6.6	16	3.67	.07	-.80
Cohesion (range 0 to 30)	2,5,6	4.2	(2.8)	4.3	14	3.9	(3.1)	3.8	16	.14	.71	.17
Total (range 1 to 54)	7	6.5	(3.3)	6.4	14	8.2	(3.5)	8.2	16	2.29	.14	-.53
Family Resource Scale[&] (FRS)	6	112.9	(27.2)	113.4	14	122.6	(10.3)	122.1	16	1.28	.27	.48
Family Support Scale[&] (FSS)	2,6,8	31.0	(10.9)	30.5	14	26.6	(6.7)	27.1	14	1.82	.19	-.39
POSTTEST #2												
Parenting Stress Index												
Child Related (range 50 to 235)	1	112.1	(9.5)	111.7	11	112.0	(9.7)	112.4	12	.05	.83	-.07
Other Related (range 74 to 200)	1	130.6	(22.8)	130.1	11	128.0	(22.8)	128.5	12	.03	.86	.07
Total (range 137 to 328)	1	242.7	(27.6)	241.8	11	240.0	(30.3)	240.9	12	.01	.94	.03
FACES III[**]												
Adaptation (range 0 to 24)	2,3,4	4.6	(3.3)	5.8	11	8.2	(3.5)	6.9	12	.74	.40	-.32
Cohesion (range 0 to 30)	2,5	3.3	(2.0)	3.3	12	4.0	(2.8)	4.0	12	.45	.51	-.29
Total (range 1 to 54)	2,6	6.2	(2.8)	6.4	12	9.4	(3.8)	9.2	12	5.33	.03	-.85
Family Resource Scale[&] (FRS)	7	119.3	(17.5)	118.9	12	119.5	(14.1)	119.8	12	.02	.88	.06
Family Support Scale[&] (FSS)	2,8,9	26.1	(13.3)	25.5	12	20.8	(9.8)	21.3	10	1.06	.32	-.36

(continued)

[*] Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

[^] $$ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$$

[**] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicated the distance from "ideal" in raw score units. A score of "0" is best.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Table 15.8 (continued)

Summary of ANCOVA's on Measures of Family Functioning For the Arkansas Hearing Impaired Study

		ORAL				TOTAL COMMUNICATION				ANCOVA		
Variables	Covariates*	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	F	p Value	ES^
POSTTEST #3												
Parenting Stress Index												
Child Related (range 50 to 235)	1	111.5	(15.6)	109.3	9	104.3	(20.9)	106.6	11	.11	.74	.15
Other Related (range 74 to 200)	1	134.6	(24.9)	133.5	9	122.7	(24.9)	123.9	11	.65	.43	.39
Total (range 137 to 328)	1	246.2	(35.4)	242.7	9	227.0	(41.8)	230.5	11	.48	.49	.31
FACES III**												
Adaptation (range 0 to 24)	2,3,4	6.5	(3.8)	7.5	8	7.3	(4.8)	6.3	11	.27	.61	.27
Cohesion (range 0 to 30)	2,5	3.4	(2.7)	3.9	8	5.4	(2.6)	4.8	11	.46	.51	-.34
Total (range 1 to 54)	2,3,4	7.8	(3.6)	8.7	8	9.7	(3.8)	8.8	11	.00	.97	-.03
Family Resource Scale& (FRS)	6,7	113.5	(17.1)	116.5	9	121.0	(21.8)	118.0	10	.02	.89	.08
Family Support Scale& (FSS)	8,7	25.4	(9.4)	24.7	9	22.7	(6.3)	23.5	9	.11	.75	-.15

---

* Covariates: 1 = Family Resource Scale; 2 = BDI Cognitive DQ; 3 = BDI Communication Total; 4 = BDI Personal Social DQ; 5 = BDI Total DQ; 6 = PSI Total; 7 = BDI Motor Total DQ; 8 = BDI Expressive Communication DQ; 9 = BDI Gross Motor DQ; 10 = Level of Father's Education; 11 = Hours Father Worked/week.

^ $$\text{ES} = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$$

** Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicated the distance from "ideal" in raw score units. A score of "0" is best.

& Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better.

Results of the parent satisfaction questionnaire are presented in Table 15.9. These findings indicate several statistically significant differences at the time of the first posttest, each of which suggests that the parents in the Oral group were more satisfied than the parents in the TC group. These differences were no longer noticeable in subsequent year, although there was a minor difference on the variable, "Satisfaction with staff who work with the child." Again, the parents in the Oral group reported being statistically significantly more satisfied than the parents in the TC group. Otherwise, parents in the two groups reported remaining quite satisfied with their child's services throughout the three years of the project.

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Table 15.9

Summary of Parent Satisfaction Questionnaire For the Arkansas Hearing Impaired Study

	Oral Communication			Total Communication			ANCOVA		
Variable*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p Value	ES^
POSTTEST #1									
Satisfaction w/staff who work with children	3.9	(.27)	14	3.4	(.51)	16	10.36	.00	1.26
Satisfaction w/ability to to communicate w/program staff	3.8	(.36)	14	3.2	(.40)	16	22.58	.00	-1.74
Satisfaction w/program goals developed for child	3.6	(.49)	14	3.4	(.50)	16	2.15	.15	-.55
Satisfaction with opportunities to participate in child's program	3.6	(.49)	14	3.3	(.45)	16	5.19	.03	-.83
Satisfaction w/rage of services available for child	3.5	(.52)	13	3.0	(.63)	16	6.08	.02	-.93
Satisfaction w/progress child made	3.7	(.48)	13	3.4	(.51)	16	1.87	.18	-.51
POSTTEST #2									
Satisfaction w/staff who work with children	3.7	(.47)	11	3.4	(.51)	11	3.05	.09	-.75
Satisfaction w/ability to to communicate w/program staff	3.6	(.51)	11	3.5	(.52)	11	.17	.68	-.17
Satisfaction w/program goals developed for child	3.3	(.47)	11	3.3	(.47)	11	.19	.66	-.18
Satisfaction with opportunities to participate in child's program	3.2	(.60)	11	3.4	(.51)	11	.59	.45	.33
Satisfaction w/range of services available for child	3.0	(.78)	11	3.3	(.47)	11	1.0	.33	.44
Satisfaction w/progress child made	3.5	(.52)	11	3.7	(.47)	11	.74	.40	.38

(continued)

* Parent satisfaction means are based on a four point scale on which high scores are most positive.

^ $ES = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$

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Table 15.9 (continued)

Summary of Parent Satisfaction Questionnaire For the Arkansas Hearing Impaired Study

	Oral Communication			Total Communication			ANCOVA		
Variable*	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	F	p Value	ES^
POSTTEST #3									
Satisfaction w/staff who work with children	3.5	(.73)	9	3.7	(.47)	11	.41	.53	.01
Satisfaction w/ability to to communicate w/program staff	3.7	(.50)	9	3.3	(.91)	11	1.36	.26	-.55
Satisfaction w/program goals developed for child	3.5	(.53)	9	3.5	(.69)	11	.00	.97	.02
Satisfaction with opportunities to participate in child's program	3.4	(.73)	9	2.9	(.83)	11	2.29	.15	-.68
Satisfaction w/range of services available for child	3.2	(.67)	9	3.0	(.63)	11	.58	.45	-.34
Satisfaction w/progress child made	3.3	(.71)	9	3.6	(.67)	11	.96	.34	.45

* Parent satisfaction means are based on a four point scale on which high scores are most positive.

$$\text{^ ES} = \frac{\text{Total Communication Adj.}\bar{x} - \text{Oral Communication Adj.}\bar{x}}{\text{Pooled SD}}$$

Parents in each group were asked to depict the nature of their communication with their child in terms of a semantic attitude checklist. The results of this analysis indicated that the fathers in the TC group perceived their communication with their child more positively than did the fathers in the Oral group (F = 5.05, p = .05). Although not statistically significantly higher, the TC mothers' perceptions of their communication with their child were slightly more positive than the Oral mothers (F = 1.45, p = .25).

Conclusions

When posed with the issue of the most appropriate mode of communication to be used in early intervention, educators and experienced parents often have fairly firm criteria for determining what types of children and families should receive intervention in what communication mode. Identifying specific child and families characteristics which are most conducive to a particular mode of communication would require a very large group study under which alternative interventions were carefully controlled. Such a large group study on a low incidence disability, such as hearing impairments, is difficult to accomplish. This study, though not including large enough groups to warrant extensive analysis by specific child and family characteristics, indicated that when children and families from a variety of backgrounds, socioeconomic status, and familiarity with deafness were randomly assigned to a mode of communication for use in high-quality early intervention programs, no statistically significant differences were found in terms of general child development (as measured by the Battelle) or on any of the other measures of child functioning which closely examined communication skills. Further, few differences were found on measures of family stress, adaptability and cohesion.

These findings suggest that the key to effective early intervention with children with hearing impairments may not be the mode of communication which is used, but is likely to be found in other variables effecting the quality of intervention such as the level of training and experience of the teacher, teacher-pupil ratio, parent involvement, and any number of other variables which may be contributing. Future research should, therefore, be focused on determining the effects of these variables on early intervention with children with hearing impairments and their families with the intent of refining the criteria for best early intervention practices with this population.

PROJECT PITCH

Project #16

COMPARISON: Moderately speech disordered, 3 and 4 year olds, home parent training speech therapy services versus clinic-based speech therapy services.

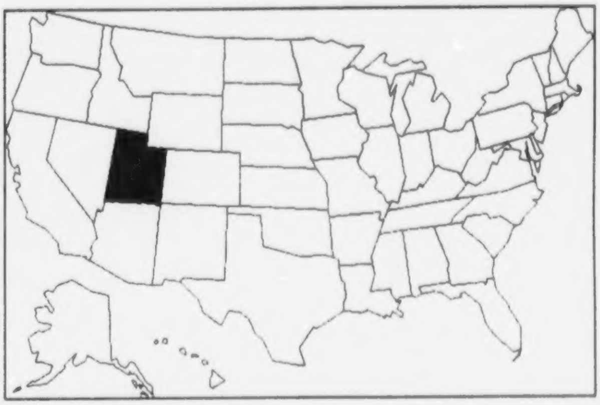
LOCAL CONTACT PERSON: Bunny McCoun, Speech Therapist, Project PITCH

EIRI COORDINATOR: William Eiserman

LOCATION: Salt Lake City, Utah

DATE OF REPORT: 4-10-1991

Rationale for Study



P.L. 99-457 mandates parental involvement in early intervention. The question of how to most appropriately involve parents, however, remains a topic of much discussion and introspection by those in the field. A common approach to fulfilling the mandate is to involve parents rather minimally by offering a monthly parent support group or some other informal mechanism for keeping parents informed about their child's progress and ways they might contribute. In other programs, however, parents are more intensively trained to work directly with the child and are given the responsibility to provide the primary, direct service intervention (Weiner & Koppelman, 1987)

One area in which parents have reportedly been quite successful in providing primary direct services to their special needs child is early intervention with speech disordered children (Barnett et al., 1988; McCoun, 1988). Programs in which parents have been involved very minimally, however, have also demonstrated success

(Karnes, Hodgins, Stoneburner, Studley, & Teska, 1968). Unfortunately, studies evaluating the effects of both approaches are fraught with methodological weaknesses; furthermore, varying degrees of parental involvement have seldom been compared systematically (Gatling & White, 1987; Reeder & Casto, 1984; White et al., 1989).

Experimental group studies, though one of the most valuable research strategies for comparing the effects of alternative interventions, have not been adequately employed to examine the effectiveness of a parents as therapists approach with a traditional clinical approach to speech therapy. Thus, the present study was designed to compare the costs and effects of a home parent training approach versus a traditional clinic-based approach to early intervention speech therapy using a randomized experimental design.

Review of Related Research

Gatling and White (1987) reviewed 162 early intervention studies that included a substantial parental involvement component (including, but not limited to, speech-related intervention). They subdivided the studies into two main categories based on the types of parent involvement used: (a) parental assistance to the child; and (b) support provided to parents and family. Eighty-one percent of the studies with parental involvement components included primarily or solely involvement of the first type, parental assistance to the child, and specifically as developmental therapists for their children.

Both the Gatling and White review and a review by Reeder and Casto (1984) reported that over 150 studies cited in recent reviews of the early intervention research supported the conclusion that parents can be effective teachers of their children who are disadvantaged, at-risk, or disabled (e.g. Bronfenbrenner, 1974; Comptroller General, 1979; Dudzinski & Peters, 1977; Garland, Swanson, Stone, & Woodruff, 1981; Goodson & Hess, 1975; Gordon, 1969; Heinz, 1979; Reisinger, Ora, &

Frangia, 1976; Simeonsson, Cooper, & Scheiner, 1982; Weikart, 1975). More specifically, a number of studies have concluded that parents can function effectively as speech and/or language therapists for their children (e.g. Arnold, Myette, & Casto, 1986; Barnett et al., 1988; Hatten & Hatten, 1971; Levenstein & Sunley, 1967; McDonald, Blott, Gordon, Spiegel, & Hartmann, 1974; Miller 1983; Seitz & Riedell, 1974).

Several reviewers (Ambron-Robinson, 1977; Parker & Mitchell, 1980; Simeonsson et al., 1982; White et al., 1989) have cautioned, however, that there have been serious methodological weaknesses in most of the studies of early intervention with children with disabilities. Studies specifically focusing on parents as speech and/or language therapists have been no exception. In many of the studies, comparison groups were not appropriate, data collectors were seldom naive, interrater reliability for dependent variable scores were frequently not obtained, and cost effectiveness was seldom addressed. Although a fairly wide range of dependent measures has been used in the studies that have been reviewed, often these measures were nonstandardized, making it difficult to make comparisons across studies and to generalize the findings to a larger population. The study reported here was designed to address some of the most significant methodological problems of previous research by using a randomized experimental design, naive diagnosticians, and a wide variety of standardized measures.

Methods

Granite School District's Project PITCH program in Salt Lake City, Utah hosted this research which included forty 3- to 5-year-old children with speech disorders who were randomly assigned to either a traditional, clinic-based program in which children received services directly from a professional speech pathologist, or to a home parent training program in which children received services from their parents who were being trained by a professional speech pathologist twice a month.

Project PITCH (Preschool Intervention and Training for Children with Handicaps) had served preschool children who were disabled and developmentally delayed (age birth to 5 years) within Granite School District since 1975. Since its beginning, Project PITCH had provided a home-based service with an emphasis on training parents to provide special intervention services for their children. Special education teachers, speech pathologists, a social worker, and a registered nurse comprised the Project PITCH staff that provided services to approximately 100 children during a 9-month school year. Forty of these children solely required speech and language related services.

Based on a developmental evaluation using the Brigance Diagnostic Developmental Inventory of Early Development conducted by one of the staff members, it was determined whether a particular child demonstrated serious developmental delays or a disability that would interfere with his/her learning. The specific criterion for inclusion in the program was that the child be at least 1 year delayed in at least one developmental domain of the Brigance. Two speech pathologists provided the speech related services examined by this study. Each carried a case load of 20 children and wrote an Individualized Educational Program for each child with assistance from the child's parents.

Program staff reported that previously collected data on student progress had demonstrated that parents were able to work successfully as teachers for their preschool children who were developmentally delayed or disabled and were committed to their role in providing this service. While the traditional PITCH service model was based on the assumption that providing service via parents as interventionists is more cost-effective than traditional child-centered therapy, PITCH personnel had never tested their assumption and were interested in conducting an objective evaluation of this hypothesis. Hence, Project PITCH personnel supported this research project with the objective of determining whether involving parents in direct service as therapists to their children is indeed as effective as a traditional clinical model with minimal parent involvement.

During the first year of the study, research activities were coordinated by the two speech therapists who communicated directly with the EIRI site coordinator. Both therapists were informed of all research procedures, and regular weekly contacts with the EIRI coordinator assured that these procedures were followed. During the second year of the project, 12 of the 40 children whose age and speech delays still met the qualification criteria for the project continued to be served in their respective programs. The other 28 subjects no longer met the qualification criteria, either in terms of age or speech delays, but were followed and posttested at the end of the year. One speech therapist coordinated all of the research activities during the second year and also communicated directly with the EIRI site coordinator. In the remainder of this report, the cohort of subjects which continued to receive services during the second year will be referred to as the "Two-year cohort" and the cohort of subjects which exited the program after one year but who continued to be followed will be referred to as the "One-year Cohort." During the third year of this study, all 40 subjects were in follow-up status.

Subjects

A total of 40 3- to 5-year-old children and their parents were included as subjects in the study. The following section will summarize the methods used in recruiting and assigning subjects to one of the two groups. Additionally, the results of the assignment to groups will be presented with respect to demographic characteristics.

Recruitment. Children were identified for speech therapy services in the Granite School District through several processes during the first 2 months of the school year, beginning September, 1987. No subjects were enrolled in the study thereafter. The majority of those identified were children of parents who, suspecting a speech problem, contacted their school or school district that, in turn, referred the children to the Project. Parents who had been served by Project PITCH in previous years were also asked to refer others to the program who might need service. Additionally, all schools in the district informed their teachers, who then informed parents of the Project PITCH services that were available. Other referral sources included the State Department of Health, local pediatricians, public health nurses, and social services agencies, a special article in the area newspaper and public service radio spots.

Children qualified for inclusion in the project on the basis of age and speech articulation abilities (children 3-5 years of age, performing below the 5th percentile on the Goldman-Fristoe, Sounds-in-Words Subtest qualified). Additionally, these children were at least 6 months to a year delayed in one or more of the domains of the Battelle Developmental Inventory. Of the 41 children identified for services, 40 of the parents elected to participate in the research. The parent who did not choose to participate was only interested in obtaining direct therapy for the child in the home; a service provided by neither of the treatments in the study.

Assignment to groups. Children who met the age and speech requirements were included as potential subjects. After receiving informed consent agreements from the children's parents, the Project PITCH therapist in charge of coordinating child enrollment contacted the EIRI coordinator and provided the articulation status and age data. After stratification on these variables, subjects were randomly assigned to groups by the EIRI coordinator to ensure that PITCH program staff had no influence on what treatment a particular child would receive. Additionally, since children were enrolled continuously over a 2-month period, the dates in which children were identified were tracked to ensure that children were assigned to treatments in the order in which they were identified.

Demographic characteristics. Of the 40 children who qualified for service, 22 were 3-year-olds while 18 were 4-year-olds. At the time of enrollment, subjects assigned to the traditional clinic-based program ranged in age from 37 to 57 months (mean = 46.2, SD 5.32), while subjects assigned to the home parent training program ranged in age from 39 to 58 months (mean = 48.0, SD 6.47).

As can be seen in Table 16.1, with the exception of number of siblings, no statistically significant differences ($p < .10$) between the two treatment groups were found on any of the demographic variables. The sample population was predominantly male, consisting of 33 males and 7 females, who, with one exception, lived in homes with both the mother and father. The predominance of males in this study is consistent with findings of several studies that have indicated that males tend to comprise approximately 71% of the preschool children requiring speech and language therapy (Department of Education, 1984). The preponderance of children in this sample who were white and from two parent homes, however, is not representative of the total population of children who receive speech therapy. Thus, these variables should be kept in mind when generalizing the findings of the study to other populations.

This sample represents a somewhat diverse group with respect to parent educational and income levels. A total of 10 (25%) of the mothers' highest completed year of education was the 12th grade. While the other 30 (75%) of the mothers indicated some college education, a total of 16 (53%) of the 30 reported that the high school diploma was the highest diploma received. Of those who obtained college educations, 12 (30%) received bachelor's degrees and 2 (5%) received master's degrees. Although not statistically different, it should be noted that there were almost twice as many mothers in the clinic-based group (9) who received college

Table 16.1

Pretest Comparability of Groups on demographic Characteristics

		Clinic-Based Child Centered			Home Parent Training Parent Centered			
	Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value
•	Age of child in months as of 7/1/87	46.2	(5.3)	20	48.0	(6.5)	20	.34
•	Age of mother in years	32.7	(5.6)	20	33.0	(4.7)	20	.84
•	Age of father in years	35.7	(5.9)	20	34.7	(7.4)	20	.87
•	Percent male*	85		20	80		20	.69
•	Years of education for mother	14.5	(1.9)	20	14.0	(1.6)	20	.37
•	Years of education for father	14.5	(1.9)	20	14.5	(1.7)	20	.79
•	Percent with both parents living at home	90		20	100		20	.15
•	Percent of children who* are Caucasian	100		20	100		20	1.00
•	Hours per week mother employed	11.3	(17.1)	20	8.0	(13.3)	20	.49
•	Hours per week father employed	40.0	(11.8)	18	41.5	(4.7)	20	.63
•	Percent of mothers* employed as technical managerial or above	15		20	20		20	.69
•	Percent of fathers* employed as technical managerial or above	70		20	65		20	.74
•	Total household income	$26,149	($9,262)	20	$28,749	($8,131)	20	.35
•	Percent with mother as* primary caregiver	95		20	100		20	.32
•	Percent of children in* daycare more than 5 hours per week	10		20	0		20	.15
•	Number of siblings	2.3	(1.4)	20	3.3	(1.9)	20	.08
•	Percent with English as primary language	100		20	100		20	1.00

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

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degrees than in the home parent training group (5). This finding is important because it has been suggested that parent education correlates positively with child performance (Scarr & Weinberg, 1983). Hence, the home parent training group may have been slightly disadvantaged in this regard.

With respect to economic status, parents' incomes ranged from $11,000 to over $50,000 per year. A total of 25 (63%) of the parents reported a yearly income of less than $30,000, while 12 (30%) of the parents reported a yearly income between $30,000 and $40,000 and 3 (8%) reported a yearly income over $40,000, only one of whom reported an income greater than $50,000.

It is also interesting to note that of the 40 mothers involved in the study, 25 (63%) were not employed outside the home, although only 5 (13%) reported working full-time (40 hours per week or more). Since this study examined the effects of parents (mothers) as home interventionists, it is especially important to note that there was no significant difference between the groups with respect to the number of mothers unemployed nor with respect to the number of hours employed per week.

Table 16.2 summarizes the demographic data on the two cohorts from the second year of the study. As can be seen, no statistically significant differences were found for the main effects of cohort or treatment group except for age of child which was expected since the older children were in the one-year cohort and the younger children were in the two-year cohort. A statistically significant interaction was found for age of mother with home-based mothers in the two-year cohort being younger than home-based mothers in the one-year cohort, and clinic-based mothers in the one-year cohort being younger than clinic-based mothers in the two-year cohort. The same relationship was seen with respect to age of fathers where a statistically significant interaction was also found. These significant interactions do not seriously impact the interpretations of main effects since these were only two

Table 16.2

Pretest Comparability of Groups Within Each Cohort on Demographic Characteristics

	CONTINUING COHORT						FOLLOW-UP COHORT						By Treatment Group		By Cohort		By Group By Cohort	
	Clinic-Based			Home-Based			Clinic-Based			Home-Based								
Variable	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	ANCOVA F	p Value	ANCOVA F	p Value	ANCOVA F	p Value
Age of child in months as of 7/1/88	43.6	(4.9)	7	43.4	(4.4)	5	47.6	(5.1)	13	49.9	(6.5)	14	.30	.58	7.34	01	.41	.53
Age of mother in years	38.3	(6.7)	7	32.8	(4.7)	5	32.3	(3.8)	13	35.5	(4.8)	14	.47	.49	.94	.34	.63	.02
Age of father in years	40.5	(7.3)	7	34.6	(5.5)	5	34.8	(4.0)	13	37.3	(8.2)	14	.54	.47	.42	.52	3.32	.07
Percent male*																		
Years of education for mother	14.1	(2.2)	7	14.0	(1.6)	5	14.6	(1.7)	13	13.7	(1.7)	14	.61	.44	.04	.84	.30	.58
Years of education for father	14.3	(1.9)	7	15.6	(1.5)	5	14.4	(1.9)	13	14.1	(1.7)	14	.63	.43	1.29	.26	1.68	.20
Percent with both parents living at home	100		7	100		5	84.6		13	100		14	1.00	.33	1.00	.33	1.00	.33
Percent of children who are* Caucasian	100		7	100		5	100		13	100		13	1.00	.33	1.00	.33	1.00	.30
Hours per week mother employed	7.8	(15.2)	7	14.0	(17.1)	5	13.2	(18.3)	13	3.5	(7.3)	14	.12	.73	.26	.61	2.44	.13
Hours per week father employed	35.7	(16.2)	7	42.0	(4.0)	4	43.1	(7.5)	13	40.1	(.3)	14	.29	.59	.81	.37	2.36	.13
Percent of mothers employed* as technical managerial or above	.0		7	.2		5	.2		13	.1		14	.19	.67	.45	.51	1.22	.27
Percent of fathers employed* as technical managerial or above	.7		7	8		5	7		13	.6		14	.01	.92	.53	.47	.36	.55
Total household income	$26,357	($12,095)	7	$34,900	($23,144)	5	$25,769	($8,227)	13	$27,678	($6,389)	14	1.78	.19	1.00	.33	.72	.40
Percent with mother as primary caregiver	100		7	100		5	92		13	100		14	.46	.50	.46	.50	.46	.50
Percent of children in daycare* more than 5 hours per week	14		7	0		5	0		13	0		14	1.93	.17	.17	.68	.17	.68
Number of siblings	2.7	(1.9)	7	2.6	(1.1)	5	2.1	(1.1)	13	3.6	(2.1)	14	1.34	.25	.08	.78	1.83	.18
Percent with English as primary language	100		7	100		5	100		13	100		14	1.00	.33	1.00	.33	1.00	.33

* Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait or characteristic were scored "0."

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differences based on 17 comparisons for the interaction variable, and these variables were not significantly correlated with any of the outcome variables.

Intervention Programs

During the first year of the project, two speech pathologists, one for each of the two interventions, devoted 20 hours per week to serving a caseload of 20 children each. The first year included a seven-month intervention period from October to May. During the second year, one therapist delivered both sets of services which included a caseload of 12 children; 7 in the clinic-based group and 5 in the home parent training group. The second year included an eight-month intervention period from September through April. In both years, the same phonetic and phonological approaches were used in each group. The phonetic approach included techniques such as: demonstration of sound placement; auditory training for sound discrimination; sound practice in isolation and nonsense syllables; sound rehearsal in single word production, short phrases, sentences, and extended speech. With the phonological approach, the relationships between sounds and language were examined. Instead of correcting each misarticulated sound one at a time, the child's speech was analyzed for patterns of errors, and the child was taught to contrast his or her incorrect feature use with the use of the proper feature. Additionally, children in both groups received training in language skills and minimal practice in other developmental areas where delays were indicated including personal/social, adaptive, motor, and cognitive domains. During the third year, all of the children were enrolled in public school programs, and no early intervention was provided since none of the subjects still qualified due to their age.

Clinic-based program. One group of children received a traditional clinical approach in which therapy was provided to groups of two children by a certified speech pathologist. This service was delivered in a clinic-based setting for 1 hour each week.

Using the pretest results, the speech pathologist for the clinic-based program paired children with similar sound errors. The parents in this group were involved in setting goals for the children's Individualized Educational Program (IEP), as is required by P.L. 99-457, although the parents were not present during any of the therapy sessions and received no formal training for working with their children at home. Based on records kept during the project, the speech pathologist in the clinic-based group typically spent 10 to 12 hours per week in service and 8 to 10 hours per week in preparation and record keeping activities during the first year of the project. During the second year, the pathologist spent 2 to 3 hours per week in services (7 children) and 2 to 3 hours per week in preparation and record keeping activities.

Home parent training. The second group of children received therapy at home from their mothers who were trained in speech therapy techniques. The training of the mothers occurred during 40-minute visits twice a month made by a certified speech pathologist.

Parent training included techniques for correcting articulation problems, techniques in auditory training, and the appropriate sequence for teaching sounds as followed in the clinic-based group (isolation, nonsense syllables, single words, and connected speech). At each session, the speech pathologist evaluated the child informally to instruct mothers in procedures to be used during the following weeks. Mothers were provided with task-analyzed procedures that included charting techniques and data-keeping methods as a basis for the mother to adapt therapy as the child progressed.

The speech pathologist in the home parent training group was responsible for evaluating the child and training the parent while the parent was responsible for conducting the child's therapy and maintaining the data. Parents were encouraged to work daily with their children and to maintain a minimum schedule of 20 to 30 minutes of therapy, four times weekly. Based on records kept during the project, the therapist in the home parent training program typically spent approximately 7 hours per week training mothers, 4 to 5 hours in transit, and between 7 to 8 hours in preparation and record keeping during the first year of the project. During the second year, the therapist spent approximately 3 to 4 hours per week training mothers, one hour in transit, and 2 to 3 hours in preparation and record keeping.

Treatment Verification

Between December 1, 1987, and March 15, 1989, data were collected to document the nature of the early intervention program at Project PITCH and to verify that the alternative treatments were being implemented as intended. Several different types of data including child attendance data, data about the degree to which parents were involved, videotaping of interventions, and the supervisor's evaluations of therapists were included and are discussed briefly below.

Attendance Data. Attendance data were kept continually by each interventionist, and completed forms were submitted monthly to the EIRI site coordinator. The coordinator reviewed attendance to determine if any subjects' attendance was irregular. If this was found, the coordinator arranged to talk with the intervenor to see how attendance for that particular child could be encouraged. Attendance data were then compiled by an EIRI clerk who calculated each child's attendance rate.

Attendance was high in both groups. During the first year, the mean attendance rate in the clinic-based treatment was 88%, ranging from 74% to 100% attendance. The mean attendance rate during the first year in the home parent training group was 96%, ranging from 85% to 100% attendance. Although attendance was quite high in both groups, this difference in attendance between groups was statistically significantly different ($p < .001$). As might be expected, this finding indicates that the home-based program was more conducive to higher rates of attendance since the intervention was brought to the child's home.

During the second year, the attendance rate for the home parent training group remained at the same high level, but the attendance rate for the clinic-based group dropped somewhat. The mean attendance rate for the home parent training group was 96% during the second year with the individual attendance rate ranging from 88% to 100%. The mean attendance rate for the clinic-based group was 66% during the second year, with the individual attendance rates ranging from 18% to 94%. The difference in attendance was found to be statistically significant ($p < .05$).

Parent Involvement Data. Four procedures were used for assessing the level of parent involvement during the first year: (1) parents were interviewed over the telephone twice during the year by a third party interviewer from EIRI; (2) parents were rated by the two therapists regarding their involvement with their child who was receiving therapy; (3) parents were interviewed (after the therapist evaluation) by the therapists regarding their involvement; and (4) parents were ranked by the therapists using the Quality of Parent Involvement Form. During the second year, parents were interviewed by EIRI staff twice regarding their involvement.

The results of these first-year procedures (see Table 16.3) indicated that the parent reports to the therapist and parent reports to a third party interviewer were moderately correlated ($r = .459$, $p = .001$) with a 65% agreement rate between the two types of reports. These data show that parents in the home parent training group reported spending significantly more minutes per week working with their child than parents in the clinic-based group. It is important to note that although the two are correlated, parents' reports given to the therapist were noticeably higher than reports of time given to the third- party interviewer. Additionally, there was some indication during the interviews that parents in the clinic-based group were defining "time spent with child" differently from parents in the home parent training group. Clinic-based parents seemed to be more liberal in their definition, including time

Table 16.3

Comparability of Groups of First Year Parent Involvement for Project PITCH

Variable	Center-Based Child-Centered $\bar{x}$	Center-Based Child-Centered (SD)	Center-Based Child-Centered n	Home-Based Parent-Centered $\bar{x}$	Home-Based Parent-Centered (SD)	Home-Based Parent-Centered n	p Value	ES^
Estimates by therapists *(average # of minutes/week)*	131.1	(51.7)	20	132.9	(52.9)	20	.91	.03
Parents' reports to therapists 1 = < 1 hour per week 2 = 1-2 hours per week 3 = 2-3 hours per week 4 = 3-4 hours per week 5 = > 4 hours per week	3.1	(1.8)	20	4.0	(1.3)	20	.10	.58
Parents report to third-party interviewer 1 = < 1 hour per week 2 = 1-2 hours per week 3 = 2-3 hours per week 4 = 3-4 hours per week 5 = > 4 hours per week	2.4	(1.7)	20	3.7	(1.1)	20	.01	.92
Parents' understanding of child's condition 1 = low 2 = average 3 = high	2.2	(.5)	20	2.6	(.5)	20	.03	.82
Parents' support of child's program 1 = low 2 = average 3 = high	2.4	(.5)	20	2.7	(.6)	20	.27	.54

^ $ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$

spent reading with the child or incidental conversation, while home-based parents mainly included structured activities aimed at speech remediation. Nevertheless, parents in the home parent training program spent statistically significantly more hours than the clinic-based parents working with their children on speech related activities ($p < .01$) (see Table 16.3).

Interestingly, reports made by the therapists prior to formally interviewing parents about their time spent working with their child did not correlate significantly with either of the other reports of parent time (i.e., 50% and 40% agreement rating were found between the ratings and the third party interview and therapists' interviews, respectively). Both therapists estimated the parents in their group to be spending approximately 1½ hours per week. For the home parent training therapist, this estimate was noticeably lower than either of the parents' reports of their time. Although less noticeable, the clinic-based therapists' estimate was also considerably lower than the parents' reports of their time.

The fact that these data do not correlate highly with one another suggests that parent involvement is very difficult to assess without using observational techniques which were beyond the scope of this study. Consequently, these data do not provide a means for reliably partitioning parents according to the number of hours they spent working with their child each week. These data, especially the data reported by the parents themselves, do suggest that parents in the home parent training group tended to be more involved with their child's development than the parents in the clinic-based group, although an exact estimate of time differences is difficult to make.

Table 16.3 also presents the results of the interviewers' ratings of the Quality of Parent Involvement. These results suggest that the groups were comparable with respect to parents' level of support for their child's respective program. As can also be seen, the parents in the home parent training group were rated significantly higher than parents in the clinic-based group with respect to knowledge of their child's condition.

Supervisor's evaluation of therapists. The PITCH supervisor conducted observational evaluations of the two therapists twice during the first year. During the second year, one therapist delivered both interventions and was evaluated once during the year. The evaluations indicated that the therapists were performing "outstandingly" in each of the areas evaluated: academic expectations, academic learning time, classroom/case management, curricular congruence, direct instruction, homework, parental involvement, rewards for achievement, teacher questioning practices, monitoring student progress and evaluative feedback, and reinforcement of self-concept.

Videotaping of the treatments. Two intervention sessions were videotaped during both the first and second year in each of the treatments with the objective of documenting the activities used in a typical session. The EIRI coordinator and a third-party evaluator observed the videotapes to determine if the sessions reflected the types of practices specified for each treatment. The third-party evaluator, who was unaware of the specific objectives of the study, was asked to provide a written description of each treatment and to specify how each was similar and different from the other. The results indicated that both interventions were consistent with what was proposed.

Anecdotal records kept by therapists. Anecdotal records were kept by each of the therapists. These records documented the types of therapy included in each session and reflected the respective approaches described above.

Site Review

A formal site review was conducted during the first year by the EIRI coordinator to ensure that the treatments were being implemented as intended and that all predetermined procedures were being followed as specified. The site review consisted of the following: a cumulative review of six subjects' folders, direct classroom and home visit observations, interviews with interventionists, and interviews with three parents. The site review included a review of services for children, observations of interactions between staff and children, a review of curriculum materials and administration, and an evaluation of the physical arrangements. All of these areas were found to be functioning in an excellent manner with very few suggestions being made for improvement. A full report of this site review is available from the EIRI site coordinator.

Therapist's use of time. To determine if therapists during the first year were actually spending similar amounts of time to deliver services to 20 children, they were asked to track their time over a week period, twice during the year. The results of the time tracking indicated a negligible difference between the total hours spent by the two therapists each week. The first time tracking sample indicated that the clinic-based therapist spent 19.5 hours preparing for and delivering services to her case load while the home parent training therapist spent 18.5 hours. The second time tracking sample indicated that the clinic-based therapist spent 20 hours while the home parent training therapist spent 17 hours. Both therapists reported that their time varies from week to week between 1 to 2 hours either direction. The second year therapist spent her time, proportionally, in a similar way as the therapists from year one. She spent approximately 12 hours delivering the two services to the 12 children served the second year.

Cost of Alternative Interventions

Determining the cost of each program alternative requires identifying all the resources necessary to operate the programs (including in-kind resources), and assigning a monetary value to them (Levin, 1983). In the present study, program personnel, parent time, facilities, transportation, and materials made up the resource requirements for both alternatives, although the programs differed in the amounts used of each of these.

The cost-effectiveness analysis was based on the value of the resources to society rather than what the program actually paid for them. Although the program paid nothing for parent time, from a societal perspective, there was an opportunity cost (e.g., parents could have been engaged in other productive activities, and the foregone activities represent a cost to them). For the present study, the amount of parent time for the clinic-based group was assigned a monetary value of $9/hour based upon women's "median usual weekly earnings for full-time work" plus benefits (U.S. Department of Labor, Bureau of Labor Statistics, 1989). The primary costs of parent time in the home parent training group were associated with the time parents spent with the speech pathologist learning intervention techniques and the time spent implementing the intervention with their children. Costs for parent time were estimated based upon (1) program records of the actual time parents spent with the speech pathologist during home visits, and (2) the amount of time the program recommended that the parents spend providing therapy to their children each week. The estimate of parent time spent with the speech pathologist is very reliable. The estimate of parent time working with the child is imprecise; however, assuming a "ball park" figure of 2 hours per week allows an illustration of the potential impact on program cost of the value of parent time.

In the clinic-based program, parents' costs included only the cost of time spent in transporting children to the clinic each week (mileage costs were paid by the program). Time estimates were made from telephone interviews with parents during which parents were asked the round-trip mileage from their home to the clinic, the average time it took to drive, and whether they car-pooled. The time cost of transportation to parents was nontrivial. In fact, parents in the clinic-based program spent almost half as much time transporting their children back and forth to therapy sessions as parents in the home parent training group spent providing therapy to their children (assuming the parents actually spent the recommended amount of time on therapy). Thus, both programs required substantial parental time. The cost of the other resources used by the programs are discussed below and presented in Table 16.4. These costs are adjusted for inflation so that all figures are in comparable 1990 constant dollars. In addition, at the bottom of Table 16.4, estimates are adjusted to reflect real discount rates of 3% and 5%.

Table 16.4

Cost Per Child of Each Program Alternative (1990 Dollars)

Resources	Clinic-Based (N = 20)	Home Parent Training (N = 20)
1. **UNDISCOUNTED COSTS**		
Agency Resources		
Direct Service Personnel	$1,644	$1,970
Administrative Personnel	160	160
Facilities	151	26
Transportation	92	86
Materials/Supplies	28	28
Subtotal	**$2,075**	**$2,270**
Contributed Resources		
Parent Intervention Time	69	788
Parent Transportation	322	0
TOTAL	***$2,466***	***$3,058***
2. **DISCOUNTED COSTS (3%):**		
Agency Resources	$2,267	$2,480
Total Resources	2,695	3,342
3. **DISCOUNTED COSTS (5%):**		
Agency Resources	$2,402	$2,628
Total Resources	$2,855	$3,540

* *Totals may not add up due to rounding errors.*

Staff personnel costs included salary plus benefits for direct service and administrative personnel, according to the percentage of FTE devoted to each alternative program. Facilities costs were estimated using the school district's daily rate for rooms. Transportation costs were based on staff mileage plus all allowances for home visits and reimbursements to parents who drove their children to the clinic-based program. Finally, the value of materials and supplies was calculated based on the amount of consumable items used by each program during the intervention period.

Data Collection

Several measures were used to examine the effects of the two types of interventions with the speech disordered subjects. The focus of the data collection was on assessing speech production, language development, cognitive/social development, and family adaptation. The specific measures used for pretesting and posttesting are discussed below.

Recruitment, training, and monitoring of diagnosticians. Three diagnosticians completed extensive training prior to administering the Battelle Developmental Inventory. All of the diagnosticians had master's degrees and extensive experience assessing infants and children with disabilities. Additionally, one speech pathologist, holding a master's degree, completed all of the speech and language tests, also after being trained. Each tester was naive to the subject assignments of those they tested. Shadow-scoring was conducted on 10% of the BDI administrations and resulted in a mean of 96% interrater agreement.

Pretesting. Parents of each child participating in the study completed an informed consent form and provided demographic information. The Battelle Developmental Inventory (BDI) was used in this study because several of the BDI domains were especially relevant to this study (cognitive, communication, and personal/social). Additionally, parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, the Family Adaptability and Cohesion Evaluation Scales, and the Family Inventory of Life Events and Changes (used only at pretest). The BDI was administered by a trained diagnostician who was unaware of the child's group assignment. Testing occurred at the center, ensuring a controlled testing environment for all subjects. The parent, usually mothers, completed the family measures following completion of the BDI. The Family Support Scale was given to the mothers to take home if they had a spouse or spouse equivalent who could also complete it. The diagnosticians completed the testing report and then sent all data to EIRI via certified mail.

Additionally, the following language, speech, and articulation tests were given to all subjects prior to intervention by a trained speech therapist who was also unaware of the subjects' assignments.

> **Goldman-Fristoe Test of Articulation (Sounds-in-Words Subtest)**. The Goldman-Fristoe Test of Articulation provides a systematic means of assessing an individual's articulation of consonant sounds. It is a nationally normed test of articulation and has proved to be a reliable and valid instrument in the field of speech pathology. The Sounds-in-Words Subtest gives a raw score that is compared with national findings that, in turn, provides a percentile ranking comparing the subject's performance with other subjects of the same age.
>
> **Patterned Elicitation Syntax Test**. The Patterned Elicitation Syntax Test (PEST) is designed to determine whether a child's expressive grammatical skills are age appropriate. In addition to providing age-referenced norms, the PEST is designed to provide information on a broad range of grammatical structures that typically occur in children's speech.
>
> **Preschool Language Scale (PLS)**. The Preschool Language Scale was designed to detect language strengths and deficiencies. It consists of two main sections: Auditory Comprehension and Verbal Ability. A supplementary articulation section is also included. Language age equivalent scores are obtained for each section.

Posttesting #1. Posttest #1 measures consisted of the BDI, parent measures, and the language, speech, and articulation measures discussed above with the exception of the PEST, which was replaced by two additional language measures described below. Additionally, a parent satisfaction with the treatment questionnaire and parent report of child's health were administered to the parents.

> **Test for Auditory Comprehension of Language (TACL-R)**. The TACL-R measures the subject's auditory comprehension of language by assessing skills in the areas of grammar, syntax, and morphology. The instrument enables the examiner to assign the subject to a development level of comprehension based on his/her performance.
>
> **Naturalistic Language Sample**. Following the suggestions made by Barrie-Blackley, Musselwhite, and Rogister (1978), Shriberg and Kwiatkowski (1980), Miller (1981), and Bloom and Lahey (1978), a naturalistic language sample protocol was developed. The protocol was developed to be used twice: (1) one sample taken between parent and child, (2) one sample taken between therapist and child. The protocol consists of procedures and

materials to be used in collecting the sample. The sample produced a number of different types of data, both qualitative and quantitative, in four domains: articulation, pragmatics, semantics, and syntax. The advantage of such a sample is that actual language is being examined allowing for assessments of generalized skills (as collected in the parent/child sample) and optimal skills (as collected in the therapist/child sample).

Posttesting #2. Posttest #2 measures were the same as for the first posttest with two exceptions. The PLS was no longer used because a number of subjects were no longer expected to reach a ceiling. It was replaced by the Structured Photographic Expressive Language Test II (SPELT) which is described below. Additionally, the FILE was discontinued as a measure due to complaints of parents regarding the sensitivity of information it elicits and its lack of relevance to the study.

Structured Photographic Expressive Language Test II (SPELT II). The SPELT II examines the expressive use of morphology and syntax. It distinguishes children who perform significantly below others of their age in the production of grammatical structures and assesses their strengths and weaknesses in those productions.

Posttesting #3. Posttest #3 measures were the same as for the second posttest with the exception of the naturalistic language sample which was no longer collected due to intensity of labor associated with this task and the lack of previous findings of relevance. Additionally, a measure was designed to evaluate parent's perception of the long-term costs and benefits of their respective interventions.

Results and Discussion

The following section will present the results of the study with respect to the following research questions:

1. To what extent are the two treatment groups and two cohorts comparable on pretest measures of child and parent functioning?
2. To what extent are there differences between the two treatment groups on measures of child functioning at the first, second, and third posttests?
3. To what extent are there differences between the two treatment groups on measures of family functioning at the first, second, and third posttests?

4. What is the relationships between the costs and the effects of each intervention?
5. To what extent are there differences between other subgroups in the two treatment groups, such as other groups determined by the stratification variables (i.e., child age, mother education, and level of parental involvement), and the two cohorts at the second and third posttests?

Each of these questions will be addressed in sequence in the section that follows.

Comparability of Groups at Pretest

As can be seen in Table 16.5, no statistically significant pretest differences were found on any of the measures of child functioning (with significance criteria at $p < .10$). These statistics indicate that the children in the two groups were very comparable prior to the initiation of the intervention. The statistics also indicate the pretreatment cognitive and verbal ability levels of the subjects in the study. For example, results on the BDI indicated that the children in the study were mildly dsiabled, demonstrating delays in the personal-social and communication (total and expressive) domains. Further, the pretest results on the Goldman-Fristoe, which is a more sensitive test within the communication domain than the BDI, indicated that subjects in both groups demonstrated severe speech delays and were performing at approximately the fourth percentile. Results of the PEST, which assesses imitative syntax ability, indicated that the children in each group were performing at approximately the 13th percentile.

In light of the performance levels demonstrated on the BDI, the Goldman-Fristoe, and the PEST, the results of the PLS appear to be inflated, with DQs around 100 and age-equivalent scores close to some subjects' actual chronological ages. In fact, the PLS has been cited before for producing inappropriately high age equivalents (e.g., McLoughlin & Gullo, 1984, p. 146). Nevertheless, it was used in this study because it is a measure commonly used by practitioners to observe relative growth over time.

Table 16.5

Pretest Comparability of groups on Child Functioning Measures

	Clinic-Based			Home Parent Training				
Variable♦	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES
Age of child in months as of 7/1/87	43.5	(5.6)	20	45.4	(6.5)	20	.35	.31
Goldman-Fristoe--Sounds in Words								
# of errors	40.0	(10.9)	20	40.0	(10.4)	20	1.00	.00
Percentile Rank	4.2	(4.4)	20	4.4	(3.3)	20	.88	.05
PEST								
Raw Score•	16.2	(12.4)	20	18.1	(11.9)	20	.61	.16
Percentile Rank	13.8	(26.9)	20	13.0	(22.0)	20	.92	-.03
PLS - DQ								
Auditory Comprehension	114.5	(19.0)	20	114.6	(13.8)	20	.38	.01
Verbal Ability	96.9	(18.7)	20	102.3	(18.9)	20	.24	.29
TOTAL	105.8	(13.4)	20	108.5	(15.2)	20	.27	.19
Battelle Developmental Inventory DQs for:								
Personal/Social	76.2	(12.6)	20	76.2	(12.9)	20	.99	.00
Adaptive Behavior	90.9	(14.6)	20	88.1	(13.4)	20	.27	-.20
Gross Motor	99.7	(19.2)	20	102.0	(21.6)	20	.47	.11
Fine Motor	93.5	(10.3)	20	90.5	(9.0)	20	.64	-.31
Motor Total	95.5	(12.1)	20	94.4	(11.9)	20	.51	-.09
Receptive Communication	84.8	(17.1)	20	79.8	(14.6)	20	.26	-.32
Expressive Communication	77.0	(18.1)	20	71.6	(17.4)	20	.59	-.30
Communication Total	79.6	(15.3)	20	74.5	(13.3)	20	.35	-.36
Cognitive Total	93.5	(10.4)	20	89.5	(11.2)	20	.44	-.37
TOTAL	84.6	(9.3)	20	83.1	(11.8)	20	.48	-.14

• Raw score is a sum of the total correct responses

♦ Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANOVAs were computed, however, using the raw score from which the DQ was derived.

$$ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

Statistically significant pretest differences were found on two of the measures of family functioning (Table 16.6). Parents in the home parent training program demonstrated higher levels of stress at pretest on the PSI than the parents in the clinic-based group ($t = -2.76$, $p < .01$), although both groups were in the normal stress range of the test (between the 15th and 80th percentiles). Total score results of the FILE and FACES indicated a similar trend. Parents in the home parent training group demonstrated higher levels of stress than the clinic-based group.

Table 16.6

Comparability of Groups on Pretest Family Functioning Measures

	Center-Based Child-Centered				Home-Based Parent Centered					
Variable	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES
Parent Stress Index										
Other Related (range 54 to 270)	111.8	(17.4)	35	19	133.9	(25.6)	72	20	.00	-1.0
Child (range 50 to 235)	100.7	(15.3)	57	20	105.7	(17.1)	65	20	.33	-.31
TOTAL (range 101 to 505)	211.7	(26.8)	38	19	239.6	(35.8)	71	20	.01	-.89
Family Support Scale♦										
Mother	27.4	(8.4)	47	20	27.6	(11.2)	50	20	.94	.03
Family Resource Scale♦										
Mother	124.4	(16.3)	61	20	118.0	(18.6)	48	20	.25	-.37
FACES Raw Score♣ (Perceived)										
Adaptability (range 0 to 30)	3.2	(2.8)		20	4.6	(2.6)		20	.09	-.52
Cohesion (range 0 to 26)	5.3	(2.5)		20	4.6	(2.6)		20	.41	-.26
TOTAL (range 0 to 40)	6.7	(2.7)		20	7.0	(2.6)		20	.74	.11
FILE Total score	9.0	(6.5)	47	20	12.6	(7.4)	29	20	.11	.53

♣ Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported on the table indicate the distance from the ideal score in raw score units. A score of 0 is best. Positive ESs indicate a negative significance.

♦ Analyses for the FSS and FRS are based on raw scores indicating the number of supports or resources indicated in the family as being available. Higher scores are considered better. Percentiles for the FSS were computed based on 643 mothers across the EIRI sites while percentiles for the FRS were based on 621 cases at the EIRI sites.

$$ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

These general trends are important to note since it might be expected that parents in the home parent training group would experience additional stress as a result of their added responsibilities of working with their child. Results from the FACES III adaptability subscale indicated that the parents in the home parent training group may have been less able to adapt to changes in the home, such as the ability

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to adapt to increased stress levels as a consequence of providing services to their child. Based on this information, these variables were identified as potential covariates for posttest analysis.

No statistically significant differences were found on the other family measures, indicating that the families in both groups had comparable levels of family support (as measured by the FSS) and resources (as measured by FRS). Of a possible score of 72 on the FSS, both groups received a mean score of approximately 27, or 38% of the support available from individuals and agencies. Of a possible score of 150 (100%) on the FRS, the groups indicated that their material resources were 79% (118.0 points) to 83% (124.4 points) adequate for the home parent training and the clinic-based groups, respectively.

The first, second, and third posttest analyses of the FRS, FSS, FILE, and the health form (which were not considered dependent variables, but important family description variables) indicated no statistically significant differences between the groups, ruling out reported shifts in support, resources, significant life events, or illness as threats to validity of the study. No statistically significant difference was found on additional services at the first or second posttests. However, at the third posttest, the home parent training group reported a statistically significantly higher number of hours of speech therapy received outside of the program. Since both group's speech and language scores from the second year were quite comparable, these findings suggest that the home parent training group may have resulted in an increased conscientiousness of parents to find additional services for their child (perhaps even when no longer needed).

A two-way analysis of covariance including the two treatment groups and the two cohorts was also computed on the pretest measures of child and family functioning. No statistically significant differences were found for either of the main effects of the interaction, suggesting that the treatment groups remained balanced within each cohort with regard to family resources and support.

Posttest Measures of Speech and Language Abilities

First Posttest. Table 16.7 displays the results of the analysis of covariance on the first posttest speech and language measures between the two intervention groups. Three standardized measures of speech and language ability were used: the Goldman-Fristoe, the PLS, and the TACL-R. These basic measures yielded 9 different measures of speech and language functioning, three of which were statistically significant at the .10 level and which favor the home parent training group in each case. The average effect size across the three total scores from the standardized measures was .51. This suggests that there was a slight advantage for the home parent training group on the measures of speech and language functioning.

Table 16.7 also shows the main scores yielded from the two naturalistic language samples. Six scores were computed and analyzed from the parent-child language sample to examine generalized speech and language skills in articulation, pragmatics, and syntax. The number of unintelligible utterances due to articulation problems correlated significantly with the number of errors made on the Goldman-Fristoe ($r = .36$, $p = .03$), the PLS Auditory Comprehension Subscale point score ($r = -.30$, $p = .06$), and the PLS Language Age ($r = -.28$, $p = .09$). As is evident in Table 16.7, no statistically significant difference between groups was found on the number of unintelligible utterances.

Pragmatics were analyzed by examining "requesting", "responding", "teaching", and "spontaneous" language. Table 16.7 shows that, proportionally, the home parent training group had significantly more child responses to parent requests than the clinic-based group, although the percentage of parent requests to the child was comparable between the groups. Although the children in the home parent training group were scored as more responsive to their mothers, children in the clinic-based

Table 16.7

First Posttest Analysis of Covariance on the Speech and Language Measures

		Clinic Based				Home Parent Training						
Variable[‡]	Covariates[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[^]
Age in months		55.5	(5.6)		20	57.4	(6.5)		20	.88	.35	.31
Goldman-Fristoe--Sounds in Words												
# of Errors	1,2,3	24.5	(12.5)	26.6	20	20.9	(13.1)	18.8	20	3.05	.09	.61
Percentile Rank	1,2,3	20.7	(22.9)	17.6	20	27.7	(26.8)	30.7	20	2.26	.14	.53
PLS - DQs												
Auditory Comprehension	1,2,4	116.6	(14.2)	114.4	20	114.5	(12.9)	116.7	20	1.65	.21	.17
Verbal Ability	1,2,6	110.0	(12.4)	109.0	20	114.4	(15.8)	115.4	20	3.48	.07	.45
TOTAL	1,2,4	113.2	(11.7)	110.8	20	113.6	(13.3)	116.0	20	3.22	.08	.42
TACL-R DQs[*]												
Words, Classes, Relations	1,2,4	110.7	(23.0)	110.0	20	114.8	(17.0)	115.0	20	1.17	.28	.25
Grammatical Morphemes	1,2,4	112.8	(25.0)	110.0	20	111.0	(21.0)	113.0	20	.76	.39	.13
Elaborated Sentences	1,2,5	109.2	(24.0)	109.1	20	113.5	(24.0)	114.0	20	.60	.44	.20
TOTAL	1,2,4	110.0	(22.0)	110.0	20	110.0	(15.0)	110.0	20	1.30	.26	.00
Parent-Child Language Sample												
Syntax-DDS	1,2,5	6.2	(1.6)	5.9	20	5.7	(1.3)	6.0	19	.14	.71	.12
Articulation # of Unintelligible utterances	1,2,7	18.2	(11.8)	20.9	20	18.3	(9.7)	15.5	19	1.80	.19	-.50
Pragmatics - % of parent[▲] utterances requests	1,2,7	32.6	(13.7)	32.4	20	29.8	(10.6)	29.8	19	.28	.60	-.21
Pragmatics - % of child[▲] utterances responses to requests'	1,2,7	34.9	(11.2)	33.6	20	41.5	(11.0)	42.7	19	4.94	.03	.82
Pragmatics - % of parent[▲] utterances teaching	1,2,8	10.7	(8.7)	10.7	20	10.8	(5.3)	10.8	18	.00	.97	.01
Pragmatics - % of child[▲] Utterances spontaneous	1,2,7	41.8	(15.3)	44.7	20	30.9	(13.0)	28.1	19	9.81	.00	-1.17
Therapist-Child Language Sample												
Articulation - % of unintelligible child utterances	1,2,9	26.2	(18.9)	29.0	20	18.2	(18.1)	15.3	20	4.37	.04	-.74
Syntax - DDS	1,2,7	6.5	(2.0)	6.4	20	6.9	(1.9)	7.0	20	.76	.39	.29

[‡] Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which the DQ was derived.

[^]
$$ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

[♦] Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Personal/Social DQ; 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Total Score DQ; 7 = BDI Expressive Communication DQ; 8 = # of hours father works per week; 9 = BDI Fine Motor DQ.

[*] Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

[▲] Proportion of utterances were computed for these analyses as follows: # of utterances of a particular type ÷ # of total utterances (whether of child or of parent)

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group demonstrated a significantly greater percentage of spontaneous utterances than the home parent training group.

The Developmental Syntax Score (DSS) correlated significantly with the PLS Total Language Age ($r = .57$, $p = .00$) and the TACL-R Total Age Equivalent ($r = .53$, $p = .001$), as well as numerous subscales of each of these measures (DSS of approximately 6 indicates functioning at slightly above the 10th percentile [Lee, 1974]). As is noted in Table 16.7, no statistically significant differences between groups was found on the DSS for the parent/child sample.

The number of unintelligible child utterances in the Therapist/Child sample correlated significantly with the Goldman-Fristoe percentile rank ($r = -.42$, $p = .008$), PLS Total Language Age ($r = -.34$, $p = .037$), and the TACL-R Total ($r = -.28$, $p = .08$). Results of the analysis of covariance indicated that the clinic-based group had significantly more unintelligible utterances due to articulation than the home parent training children.

The DSS performed on the Pathologist/Child Sample correlated significantly with number of errors made on the Goldman-Fristoe ($r = -.27$, $p = .09$), PLS Total Language Age ($r = .44$, $p = .005$), and the TACL-R Total Language Age ($r = .37$, $p = .02$). This DSS indicates that optimal functioning was between the 10th and 25th percentile (Lee, 1974). Results of the analysis of covariance indicated no statistically significant difference between the two groups.

Second Posttest. The results of the second posttest one-way analysis of covariance on measures of speech and language abilities are displayed in Table 16.8. As can be seen, no statistically significant difference was found on the Goldman-Fristoe Test of Articulation, although the home parent training group scored .41 of a standard deviation better than the clinic-based group. It is important to note that both groups made impressive gains since the pretest, improving from the 4th percentile to the 30th and 41st percentiles in the clinic-based and home parent training groups, respectively. While no statistically significant differences between the groups were found in expressive use of morphology and syntax, as measured by the SPELT II, the home parent training group scored one-third of a standard deviation higher than the clinic-based group. Differences of three-and four-tenths of a standard deviation, as was found on both the Goldman-Fristoe and the SPELT II, are typically considered to be educationally significant. However, the fact that these are not statistically significant should make one cautious about interpreting them as educationally significant because the difference between the scores may be due to sampling fluctuation. If the results of replication and further study indicate that such differences are, in fact, this large, then this is an important finding.

Differences between the two group's performance was least noticeable on receptive language, as measured by the TACL-R. No statistically significant differences were found between the groups on their TACL-R scores and effect sizes were less than .30. Nevertheless, as can be seen in Table 16.8, the effect sizes for some of the TACL-R scores indicated, in contrast to the results on the other speech and language measures, that the clinic-based group scored slightly better than the home parent training group in receptive abilities.

Third Posttest. The results of the third posttest one-way analysis of covariance on measures of speech and language abilities are displayed in Table 16.9. This table shows that no statistically significant differences were found on the Goldman-Fristoe Test of Articulation, although the home parent training group scored .40 of a standard deviation better than the clinic-based group. As was mentioned in the second year analysis section above, such a difference is typically considered to be educationally significant, although this difference must be view cautiously since no statistically significant differences were found. The scores on the Goldman-Fristoe indicate that both groups continued to progress, moving from the

Table 16.8

Second Posttest Analysis on the Speech and Language Measures

Variable♣	Covariates♦	Clinic Based $\bar{x}$	Clinic Based (SD)	Clinic Based Adj. $\bar{x}$	Clinic Based n	Home Parent Training $\bar{x}$	Home Parent Training (SD)	Home Parent Training Adj. $\bar{x}$	Home Parent Training n	ANCOVA F	p Value	ES^
Age in months as of 7/1/89		67.5	(5.6)		20	69.4	(6.5)		20	.88	.35	.29
Goldman-Fristoe--Sounds in Words												
# of Errors	1,2,3	13.5	(9.4)	14.8	20	12.1	(10.0)	10.8	20	1.40	.24	.43
Percentile Rank	1,2,3	33.7	(26.2)	30.3	20	38.0	(28.7)	41.5	20	1.29	.26	.41
SPELT												
Raw score	1,2,4,5	41.0	(6.7)	40.4	20	40.5	(8.8)	41.1	20	.06	.81	.08
Percent Correct	1,2,5	81.9	(13.4)	80.8	20	81	(17.6)	82.1	20	.06	.81	.09
Percentile rank	4,5	56.0	(32.5)	53.0	20	60.5	(34.4)	63.5	20	1.19	.28	.32
TACL-R DQs*												
Words, Classes, Relations	1,2,6	115.9	(23.2)	113.8	20	117.9	(20.7)	120.0	19	.56	.46	.28
Grammatical Morphemes	1,2,5	115.4	(22.2)	117.1	20	109.6	(21.9)	107.9	19	1.22	.28	-.42
Elaborated Sentences	1,2,6	109.2	(23.7)	112.8	20	111.6	(21.7)	107.9	19	.38	.54	.22
TOTAL	1,2,6	110.7	(16.9)	111.9	20	110.2	(13.9)	109.0	19	.29	.59	-.18

Table 16.9

Third Posttest Analysis on the Speech and Language Measures

Variable♣	Covariates♦	Clinic Based $\bar{x}$	Clinic Based (SD)	Clinic Based Adj. $\bar{x}$	Clinic Based n	Home Parent Training $\bar{x}$	Home Parent Training (SD)	Home Parent Training Adj. $\bar{x}$	Home Parent Training n	ANCOVA F	p Value	ES^
Age in months as of 7/1/89		79.6	(5.6)		20	81.4	(6.5)		20	.88	.35	
Goldman-Fristoe--Sounds in Words												
# of Errors	1,2,3	7.8	(6.2)	9.0	20	6.2	(7.3)	4.9	20	2.68	.11	.61
Percentile Rank	1,2,3	42.3	(31.7)	39.3	20	51.0	(34.5)	53.9	20	1.45	.24	.41
SPELT												
Raw score	1,2,4,5	44.4	(5.4)	44.1	19	44.7	(4.1)	44.9	19	.26	.62	.17
Percent Correct	1,2,5	88.7	(10.8)	88.2	19	90.0	(8.2)	90.5	19	.42	.52	.24
Percentile rank	4,5	68.2	(31.7)	66.5	19	72.5	(27.6)	73.6	19	.64	.43	.25
TACL-R DQs*												
Words, Classes, Relations	1,2,6	108.9	(15.7)	108.0	20	113.8	(13.9)	114.6	20	1.40	.25	.44
Grammatical Morphemes	1,2,5	114.8	(22.0)	116.7	20	108.8	(16.8)	107.0	20	2.28	.14	-.49
Elaborated Sentences	1,2,6	104.4	(16.3)	105.4	19	106.4	(22.7)	105.4	20	.00	.99	.00
TOTAL	1,2,6	108.1	(13.8)	107.9	20	106.7	(13.4)	106.9	20	.05	.83	-.07

♣ Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which the DQ was derived.

^ $$ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

♦ Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Personal/Social DQ; 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Cognitive DQ

* Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

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30th and 40th percentiles during the second posttest to approximately the 40th and 54th percentiles at the third posttest, in the clinic-based and home parent training groups, respectively.

Results of the analysis of covariance on the SPELT II indicated no statistically significant difference between the two treatment groups. It is notable that the subjects in both groups have progressed from approximately the 53rd and 63rd percentiles on the second year posttest to approximately the 67th and 74th percentiles on the third year posttest in the clinic-based and home parent training groups, respectively.

Analyses of Covariance on the third-year posttest on the TACL-R also indicated no statistically significant differences on the words, classes and relations, grammatical morphemes, or elaborated sentences subscales, nor on the analysis performed on total scores. Subjects in both groups appeared to have stabilized their DQ scores between the second and third posttests on the TACL-R.

Posttest Measures of General Development

First posttest. Table 16.10 shows the results of the posttest analysis of covariance between the two groups on the BDI. Again, the home parent training group demonstrated at least comparable developmental abilities to the clinic-based group. While no statistically significant difference was found on the total BDI score, the home parent training group performed statistically significantly better than the clinic-based group on the motor total subscale (p = .06). This difference may be due to the fact that the home parent training group had a greater opportunity for interdisciplinary intervention, although the possibility of chance fluctuation should not be dismissed. The most educationally significant difference in general development was in the personal-social domain in which the home parent training group score approximately .50 of a standard deviation better than clinic-based group.

Table 16.10

First Posttest Analysis of Covariance on the Battelle Developmental Inventory

		Center-Based Child Centered				Home-Based Parent Centered						
Variable♣	Covariates♦	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	ES^
Age in months as of 7/1/89		55.5	(5.6)		20	57.4	(6.5)		20	.88	.35	.42
Battelle Developmental Inventory* (BDI) DQs for:												
Personal/Social	1,2,3	80.6	(15.4)	77.5	20	78.1	(13.6)	81.3	20	2.03	.16	.26
Adaptive Behavior	1,2,4	98.4	(13.0)	97.2	20	93.5	(12.6)	94.7	20	.07	.78	-.20
Gross Motor	1,2,5,6,7	97.1	(19.5)	96.8	20	107.6	(17.2)	107.9	20	4.20	.05	.60
Fine Motor	1,2,8	89.7	(10.9)	89.6	20	92.4	(7.5)	92.5	20	.99	.33	.32
Motor Total	1,2,4,7	92.2	(9.9)	92.5	20	97.6	(9.0)	97.3	20	3.38	.07	.51
Receptive Communication	1,2,3	90.3	(19.5)	89.4	20	84.8	(14.8)	85.6	20	.00	.98	-.22
Expressive Communication	1,2,9,10	82.5	(16.2)	81.8	20	78.2	(11.9)	78.9	20	.44	.51	-.21
Communication Total	1,2,9	85.1	(16.4)	83.8	20	80.7	(11.0)	82.0	20	.11	.75	-.13
Cognitive Total	1,2,11	94.8	(13.4)	[illegible]	20	96.1	(10.7)	97.1	20	1.39	.25	.27
BDI Total	1,2,7	88.6	(11.5)	88.4	20	88.0	(8.8)	88.0	20	.67	.42	-.04

♣ Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw srore by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which the DQ was derived.

$$ES = \frac{\text{Home-based } \bar{x} - \text{center-based } \bar{x}}{\text{Pooled SD}}$$

♦ Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Motor Total dQ; 7 = BDI Total Score DQ; ;8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ

Second posttest. Table 16.11 presents the results of the One-Way Analysis of Covariance computed on the Battelle Developmental Inventory. These findings indicate that the home parent training group scored significantly higher in personal/social ability and adaptive behavior than the clinic-based group. Additional analyses of the subdomains under the Personal/Social domain are also presented in Table 16.10. Statistically significant differences were found in three of the subdomains: Expressions of Feelings/Affect, Self-Concept, and Social Role. In each case, the home parent training group scored statistically significantly higher than the clinic-based group, indicating that the home parent training program was more effective in developing the child's ability to express feelings, in self-concept development, and in developing skills relating to social role-taking. Since the univariate analyses indicated a statistically significant difference in the Adaptive Domain, it was determined that the Personal Responsibility subdomain, within the Adaptive Domain, would be examined--the Personal Responsibility subdomain

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Table 16.11

Second Posttest Analysis of Covariance on the Battelle Developmental Inventory

		Clinic-Based				Home-Based Parent Centered						
Variable♣	Covariates♦	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	$\bar{x}$	(SD)	Adj. $\bar{x}$	n	ANCOVA F	p Value	$\widehat{ES}$
Age in months as of 7/1/89		67.5	(5.6)		20	69.4	(6.5)		20	.88	.35	.31
Battelle Developmental Inventory												
Personal Social	1,2,3	74.6	(14.8)	71.6	20	77.7	(18.1)	80.7	20	5.34	.03	.55
Adult Interaction	1,2,3	33.4	(2.5)	32.8	20	33.4	(2.7)	34.0	20	1.61	.21	.45
Expression of Feeling Affect	1,2,3	22.0	(2.4)	21.8	20	23.4	(1.6)	23.6	20	5.55	.02	.90
Self-Concept	1,2,3	25.1	(2.2)	24.7	20	25.5	(2.5)	25.8	20	1.56	.22	.38
Peer Interaction	1,2,3	25.1	(5.9)	23.9	20	26.0	(5.1)	27.1	20	2.64	.11	.58
Coping	1,2,3	10.9	(5.3)	9.9	20	11.8	(4.9)	12.7	20	2.45	.13	.55
Social Role	1,2,3	18.1	(4.9)	17.2	20	18.4	(4.5)	19.2	20	1.99	.17	.43
Adaptive Behavior	1,2,4	89.2	(14.8)	87.5	20	91.9	(14.2)	93.5	20	3.03	.09	.41
Personal Responsibility	1,2,3	19.8	(5.8)	18.4	20	21.6	(6.5)	22.9	20	4.77	.04	.73
Gross Motor	1,2,5,6,7	91.7	(16.1)	91.0	20	95.2	(13.7)	96.0	20	1.50	.23	.34
Fine Motor	1,2,8	86.7	(11.3)	86.8	20	88.4	(10.7)	88.3	20	.48	.49	.14
Motor Total	1,2,4,7	87.8	(11.5)	88.8	20	90.2	(9.6)	89.2	20	1.07	.31	.04
Receptive Communication	1,2,3	95.4	(16.7)	93.0	20	90.9	(17.1)	93.3	20	.43	.52	.02
Expressive Communication	1,2,9,10	83.9	(18.5)	86.4	20	79.6	(7.5)	77.1	20	.40	.53	-.72
Communication Total	1,2,9	87.5	(14.3)	87.4	20	83.9	(10.3)	83.9	20	.01	.93	.28
Cognitive	1,2,11	94.4	(13.2)	93.3	20	92.7	(10.3)	93.8	20	.54	.47	.04
Battelle Total	1,2,7	86.9	(11.8)	86.6	20	87.4	(9.7)	87.7	20	1.50	.23	.10

♣ Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which the DQ was derived.

$$\widehat{ES} = \frac{\text{Home-based adj.}\bar{x} - \text{center-based adj.}\bar{x}}{\text{Pooled SD}}$$

♦ Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Motor Total DQ; 7 = BDI Total Score DQ; 8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ

was the most relevant to this population. The results of this analysis indicated that the home parent training group scored statistically significantly higher than the clinic-based group, representing a mean standard difference of .88.

Although no other statistically significant differences were found on the other domains of the Battelle, an examination of effect sizes and means indicated that the home parent training group consistently scored slightly higher than the clinic-based group, with the exception of the scores on the expressive communication subdomain. In this case, the clinic-based group scored .39 of a standard deviation better than the home parent training group. These findings do not corroborate with the findings on the individual assessments of speech and language ability. It is important to note, however, that in general communication skills as measured by the Battelle, both groups have made impressive gains since the pretest.

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Third posttest. Table 16.12 presents the results of the one-way analysis of covariance on the Battelle Developmental Inventory for the third posttest. These findings indicated a statistically significant difference in favor of the home parent training group on the cognitive domain of the BDI (p< .09, ES=.39). No statistically significant differences at the time of the third posttest on any of the other domains were found, however. It should be noted that both groups made substantial gains in DQ in each of the domains between the second and third posttest. At the third posttest, DQ's were at or near 100, indicating remediation of deficiencies noted in previous years in both groups. While differences noted on the second posttest Personal-Social and Adaptive domains warranted subdomain analyses, no subdomain analysis seemed relevant for the third posttest scores.

Table 16.12

Third Posttest Analysis of Covariance on the Battelle Developmental Inventory

		Clinic-Based				Home-Based Parent Centered						
Variable[♣]	Covariates[♦]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[~]
Age in months as of 7/1/90		79.6	(5.6)		20	81.4	(6.5)		20	.88	.35	.30
Battelle Developmental Inventory[*] DQs for:												
Personal/Social	1,2,3	102.9	(16.0)	103.4	20	104.5	(16.4)	104.0	20	.08	.78	.04
Adaptive Behavior	1,2,4	102.1	(11.1)	103.2	20	100.0	(13.7)	98.9	20	.07	.79	-.35
Gross Motor	1,2,5,6,7	96.6	(12.3)	96.4	20	100.8	(10.4)	101.0	20	2.19	.15	.41
Fine Motor	1,2,8	100.7	(14.1)	100.8	20	101.6	(15.6)	101.6	20	.09	.76	.05
Motor Total	1,2,4,7	96.0	(9.4)	96.9	20	99.3	(11.5)	98.4	20	.56	.46	.14
Receptive Communication	1,2,3	102.2	(14.9)	103.7	20	103.4	(13.8)	101.9	20	.10	.75	-.13
Expressive Communication	1,2,9,10	96.6	(15.4)	97.9	20	101.5	(14.8)	100.3	20	1.41	.24	.16
Communication Total	1,2,9	95.7	(12.5)	96.7	20	100.1	(14.4)	99.1	20	.96	.34	.18
Cognitive Total	1,2,11	97.6	(10.2)	96.8	20	99.7	(8.3)	100.5	20	2.86	.09	.40
BDI Total	1,2,7	98.4	(7.0)	99.2	20	98.8	(9.5)	99.0	20	.41	.53	-.02

[♣] Developmental Quotients (DQs) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which the DQ was derived.

[~] $$\text{ES} = \frac{\text{Home-based adj.}\bar{x} - \text{center-based adj.}\bar{x}}{\text{Pooled SD}}$$

[♦] Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Motor Total DQ; 7 = BDI Total Score DQ; 8 = BDI Fine Motor DQ; 9 = BDI Communication Total DQ; 10 = BDI Personal/Social DQ; 11 = BDI Cognitive DQ

Posttest Measures of Family Functioning

First Posttest. No statistically significant differences were found between the groups on the PSI or the FACES (see Table 16.13). The means for both groups

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Table 16.13

Posttest #1, #2, and #3 Analysis of Covariance of Groups on the Family Functioning Measures

		Clinic-Based					Home Parent Training							
Variable	Covariates♦	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	p Value	ES^
POSTTEST #1														
● Parent Stress Index														
Other Related (range 54 to 270)	1,2,3	110.8	(21.9)	122.2	52	19	133.0	(25.4)	121.6	52	20	.01	.92	.03
Child Related (range 50 to 250)	1,2,4	99.8	(18.1)	103.7	61	20	110.2	(18.4)	106.2	67	20	.25	.62	-.14
TOTAL (range 101 to 505)	1,2	212.7	(35.4)	225.4	56	20	243.2	(39.4)	230.4	62	20	.31	.58	-.13
● FACES Raw Score - Perceived*														
Adaptability (range 0 to 30)	1,2	3.5	(2.6)	3.6		20	4.4	(3.4)	4.4		20	.56	.46	-.27
Cohesion (range 0 to 26)	1,2,5	4.8	(3.3)	4.5		20	3.6	(3.1)	3.9		20	.33	.57	.19
TOTAL (range 0 to 40)	1,2,6	6.5	(3.2)	6.3		20	6.3	(3.8)	6.4		20	.00	.95	-.03
POSTTEST #2														
● Parent Stress Index														
Other Related (range 54 to 270)	1,2,3	116.2	(25.2)	127.6	41	19	135.8	(23.0)	124.3	73	20	.25	.62	.14
Child Related (range 50 to 250)	1,2,4	96.9	(14.7)	102.8	42	20	114.1	(23.2)	108.2	80	20	.73	.40	-.28
TOTAL (range 101 to 505)	1,2	213.8	(36.1)	226.5	39	20	249.9	(40.9)	237.0	79	20	.88	.36	-.27
● FACES Raw Score - Perceived														
Adaptability (range 0 to 30)	1,2	2.6	(2.5)	2.9		20	4.5	(3.5)	4.1		20	1.22	.28	-.40
Cohesion (range 0 to 26)	1,2,5	3.5	(2.3)	3.1		20	3.7	(2.7)	4.2		20	1.56	.22	-.44
TOTAL (range 0 to 40)	1,2,6	5.0	(2.3)	5.0		20	6.4	(3.5)	6.4		20	1.53	.22	-.48
POSTTEST #3														
● Parent Stress Index														
Other Related (range 54 to 270)	1,2	109.4	(20.7)	115.9	41	20	126.9	(22.0)	120.4	48	20	.56	.46	-.21
Child Related (range 50 to 250)	1,2,4	92.9	(15.4)	97.9	47	20	101.6	(17.1)	96.5	45	20	.07	.79	.09
TOTAL (range 101 to 505)	1,2	202.3	(32.2)	213.2	39	20	228.5	(36.0)	217.6	46	20	.22	.64	-.12
● FACES Raw Score - Perceived														
Adaptability (range 0 to 30)	1,2	3.3	(2.7)	3.7		20	3.6	(2.7)	3.1		20	.42	.52	-.22
Cohesion (range 0 to 26)	1,2,5	4.4	(1.9)	4.1		20	3.9	(2.9)	4.3		20	.06	.81	-.03
TOTAL (range 0 to 40)	1,2,6	6.0	(2.0)	5.9		20	6.1	(2.6)	6.2		20	.16	.69	-.13

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* Scores for each subscale of the FACES were derived from the "ideal" score reported in the technical manual. Scores reported on the table indicate the distance from the ideal score in raw score units. A score of 0 is best. Positive ESs indicate a negative significance.

^ $$ES = \frac{\text{Home-based Adj.}\bar{x} - \text{center-based Adj.}\bar{x}}{\text{Pooled SD}}$$

♦ Covariates: 1 = PSI Total; 2 = FACES Adaptability Subscale; 3 = PSI Other Subscale; 4 = PSI Child Subscale; 5 = FACES Cohesion Subscale; 6 = FACES Total

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remained within the normal or healthy stress range and indicated that neither approach led to a change in stress or family adaptability and cohesion as measured by the PSI or the FACES (see Table 16.13).

Results of the Parent Satisfaction Questionnaire indicated, overall, that parents in both groups were "moderately" to "very satisfied" with the service they received, although parents in the clinic-based program expressed some negative feelings about their child's program. Group means were different on three of the Parent Satisfaction items: Satisfaction with Goals ($p < .04$), Opportunity for Parent Participation ($p < .000$), and Satisfaction with Program ($p < .07$). Further, when asked to state their preference for either a clinic-based or home parent training program, 70% of the 40 parents preferred the home parent training services (see Table 16.14). The advantages and disadvantages parents reported for each type of intervention were as follows:

Advantages of home-based:

Parent learning
Teaching in home environment
Parent-child relationship
Daily teaching

Disadvantages of home-based:

Little time/interruptions
Hard to work with own child
Lack of socialization

Advantages of center-based:

Regular schedule
Child works with professional
Socialization

Disadvantages of center-based:

Driving/babysitters
No parent-child interaction
No on-going training

Second posttest. Table 16.13 also presents the results of the One-Way Analysis of Covariance on the measures of family functioning at the second posttest. These results indicate that there were no statistically significant differences between the groups in stress, as measured by the PSI, or in family adaptability and cohesion as measured by the FACES III. The home parent training group did, however, score slightly less healthy than the clinic-based group on the FACES III Adaptability and Cohesion subscales and on the FACES III Total score.

Table 16.14

First Posttest Comparability of Groups on Parent Attitudes Questionnaire

Training	Clinic-Based	Home Parent
Parents' perceived positive changes in child's behavior as a consequence of child's training.	85% (17/20)	90% (18/20)
Parents' perceived improvement in parent-child relationship as a consequence of child's training.	70% (14/20)	80% (16/20)
Parents would choose to have child in this service.	55% (11/20)	95% (19/20)

When asked at the end of the second year which program they would like to participate in if they were given the choice, once again the majority of the participating 40 parents chose the home parent training groups indicating that they valued being involved with their children's educational program, even if there was no measurable difference due to their involvement.

Third posttest. Results of the third posttest one-way analysis of covariance on the family functioning measures are also shown in Table 16.13. As can be seen, no statistically significant differences between the two groups on the PSI or the FACES III were found. Both groups' third posttest scores on the PSI, however, were substantially lower than the second posttest scores, indicating a comparable reduction in stress had occurred in both groups. Scores on the FACES III were comparable between the two groups at the third posttest and continued to be in the normal/healthy range, not fluctuating greatly since the second posttest. These findings are important because they demonstrate the absence of differences between the groups with regard to stress and family dynamics which may have influenced scores on measures of child functioning.

Results of the parent survey indicated once again that of the 20 parents in the home training intervention, 60% reported that after three years they felt very positive about their intervention, while 35% felt were mostly positive and 5% (one parent) were mostly negative. In the clinic-based group 80% felt very positive, 10% felt mostly positive, and 10% felt mostly negative about their intervention experience. Nevertheless, as was found in earlier years, the majority of parents in both groups continued to identify the home parent training intervention as the treatment of preference.

As a part of the parent survey, parents were asked to select from a list of positive and negative words, those words which most depicted their experience (i.e. intimidating, fun, frustrating, easy, confusing, productive, pointless, tense, comfortable, rewarding, natural, stressful, hard work, successful, difficulty, worthwhile, disruptive, and strengthening). The results of the analysis of variance on the total number of positive associations minus the total number of negative associations indicated no significant differences in the perceptions of their experiences associated with their respective interventions ($F = .58$, $p < .45$). Parents in both groups reported a majority of positive associations, although those in the home parent training group did report more work, stress, and disruption associated with that intervention.

Parents were also asked to identify some of the changes in their lives which had occurred during and after the time of their intervention. No remarkable differences between the groups were noted. While it might have been expected that the home parent training parents would be more likely to report increased confidence in working with their child's school work, this area was the most commonly reported area of change in both treatment groups. The second most common responses, which surprisingly, both groups evidenced, was a increased confidence in interacting with their child's teacher and an increased sense of control of their child's destiny.

Also as a part of the parent survey, parents were asked, in an open-ended question, to identify how much they would be willing to pay for their respective intervention, had it not been provided free of charge. Responses from parents in the clinic-based group ranged from \$5 to \$130 per month with a mean of \$44 per month. Responses of parents in the home parent training group ranged from 0 to \$200 per month with a mean of \$55.25 per month. Correlations were computed between parents responses on this question and their income. The results indicated no significant correlation ($r = .16$, $p < .31$). A correlation analysis was also computed between the amount parents would be willing to pay and the gain score (between the pre and third posttest) on the Battelle total score and a gain score on the Goldman-Fristoe. The results of these computations indicated no significant correlations ($r = -.034$, $p < .84$ [BDI], $r = -.07$, $p < .66$ [Goldman-Fristoe]). It is noteworthy that parents' mean values in each group were quite comparable, each reporting being willing to pay for approximately 20% of the actual program costs per child.

Posttest Subgroup Analyses

First posttest (summary). Analyses on the first posttest data were conducted on three subgroups to examine the effects of the two interventions comparing: (1) three-year-olds versus four-year-olds, (2) children whose mothers had a maximum of a high school education versus children whose mothers had attended college, and (3) children in the home parent training group whose mothers had reported working with them more than three hours per week versus children in the home parent training group whose mothers had reported working less than three hours per week. The results of these analyses are summarized below.

Group by age. The results of this set of analyses indicated a trend favoring the 3-year-olds in the home parent training program over the 3-year-olds in the clinic-based program in verbal ability and a general tendency for the 3-year-olds in the home parent training program to benefit more than all of the others in the two programs. Specifically, home parent training 3-year-olds scored higher than clinic-based 4-year-olds on the PLS verbal ability DQ [t(15) = 2.46, p = .05], the PLS Auditory Comprehension DQ [t(15) = 3.37, p = .01], and the PLS total DQ [t(15) = 3.25, p =.01]. Additionally, this same group of home parent training 3-year-olds scored higher than the home parent training 4-year-olds on the PLS Auditory Comprehension DQ [t(18) = 2.60, p = .05] and the PLS total DQ [t(18) = 2.75, p =.05]. On the PLS Auditory Comprehension DQ, the clinic-based 3-year-olds performed better than the clinic-based 4-year-olds [t(18) = 2.75, p = .05] and the home parent training 4-year-olds [t(20) = 2.30, p = .05]. Mothers of the home parent training 3-year-olds, however, were more stressed than the other mothers in the study. These findings, if substantiated with additional research, may suggest that age is an important determinant of the most appropriate type of parent involvement to be used in a child's program and that stress may be a special consideration when working with mothers of 3-year-olds.

Level of mother education. While it might be expected that less educated mothers would be less effective with their children, these findings do not support this belief. Contrarily, of the children in the home parent training group, there were no measures on which the children of more highly educated mothers performed significantly better than those whose mothers had received only a high school education. In fact, there were several measures on which the children of less educated mothers performed significantly better than the children of mothers with higher education in the home parent training group. This may be due to the fact that the less educated mothers appeared to take the responsibility more seriously of working with their child, while the mothers with higher education tended to assume they were able to work with their child without the training and suggestions provided by the therapist. Further, less educated mothers experienced lower stress, again suggesting that they may adapt well to such a role.

While these findings may suggest that we dismiss the notion that less educated mothers are ineffective as therapists to their children, it should be noted that even the lowest levels of education of mothers in this study (all of whom had completed the 12 grade) were not as extreme as is often prevalent in other populations. Therefore, additional research should examine the question of the effect of mother's educational levels on their ability to work effectively as therapists for their children.

Level of parent involvement. The first year of this study attempted to examine the critical variable of parent time and the challenge of measuring parent time spent with the child in education-related activities. One methodological conclusion that can be drawn is that it is vital that parent time measurement be triangulated so that reliability can be tested in a number of ways. Second, it was concluded that in the absence of an extensive naturalistic study on parent time, estimates of parent time collected by means used in this study were suspect.

Given the questionable nature of the time data that was collected, conclusions about the effects of variable time spent working with the child in the home parent training group can be drawn only with caution. While it is possible to distinguish two groups based on the reported number of hours spent each week with the child, in most cases there were no significant differences between the performances of the children in each group. Nevertheless, the "more than 3-hours-per-week" group did perform significantly better than the lower time-group on articulation, and the mothers demonstrated lower stress. It appeared, in fact, that the children whose mothers spent less than 3 hours per week working with them performed no better than the children in the center-based group who were provided therapy by the professional therapist 1 hour per week. These results suggest that parent time committed to working with their child may be directly associated with child performance.

However, additional research is vital in order to more reliably measure parent time actually spent with the child and its subsequent costs and effects.

Second posttest subgroup analysis by cohort. The most meaningful subgroup analyzed from the second posttest data was a comparison of the effects of the interventions on the one-year cohort versus the two-year cohort. To set the context of this analysis it is important to note that analysis of parent reports of additional services, for the one-year cohort, indicated no significant difference between the two treatment groups; children in the clinic-based, one-year cohort received a comparable amount of intervention service during the follow-up year as the home parent training one-year cohort. These data indicate that according to parent reports, most children in the one-year cohort did not receive speech therapy services during the follow-up year. No statistically significant differences between groups or between cohorts were found on the Goldman-Fristoe Test of Articulation at the second posttest, although effect sizes favored the home parent training group (see Table 16.15). As can be seen, both cohorts of children in the home parent training group performed better than the clinic-based group in their respective cohorts. Interestingly, the two home parent training subgroups scored comparably, and indicated that the second year of intervention had remediated the speech disorders of the continuing children to a similar level as the one-year children. The two clinic-based subgroups, however, were less comparable indicating that the second year of clinic-based intervention did not result in a substantial gain.

Subgroup analysis by cohort on the TACL-R indicated very comparable performance of children across all four cohort/intervention subgroups. Cohort subgroup analysis on the SPELT II (also shown in Table 16.15) and the Battelle (shown in Table 16.16) indicated no significant differences due to cohort or cohort/intervention interactions. Analyses on the measures of family functioning indicated a significant interaction on the FACES Adaptability scale and the FACES Total score.

Table 16.15

ANCOVA's on Speech and Language Measures at Posttest #2

		Continuing Cohort								Follow-up Cohort								By Treatment Group		By Cohort		By Group By Cohort	
		Clinic Based				Home Based				Clinic Based				Home Based									
Variable[*]	Covariates[◆]	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	p Value	ANCOVA F	p Value	ANCOVA F	p Value
Age of child as of 7-1-89		64.4	(4.8)		7	64.8	(4.6)		5	69.2	(5.4)		13	70.9	(6.4)		15	.26	.61	7.60	.01	.10	.75
Goldman-Fristoe Sounds in Words # of errors	1,2,3	19.6	(6.3)	19.0	7	15.4	(12.8)	14.7	5	10.2	(9.3)	12.0	13	11.0	(9.1)	10.[illegible]	15	.57	.46	2.48	.13	.20	.66
Goldman-Fristoe Sounds in Words %ile Rank	1,2,3	15.7	(10.6)	17.1	7	33.8	(33.6)	35.9	5	43.4	(27.2)	38.7	13	39.4	(28.0)	40.6	15	.88	.35	1.70	.20	.80	.38
TACL-R (DQs)[♣]																							
Total	1,2,4	115.2	(19.8)	114.3	7	120.5	(14.7)	115.6	5	108.3	(15.5)	111.9	13	106.2	(11.7)	108.5	15	.03	.86	.73	.40	.23	.64
Words, Classes & Relations	1,2,4	119.6	(22.9)	118.0	7	119.3	(18.4)	120.7	5	113.9	(24.0)	111.1	13	117.0	(21.4)	120.0	15	.40	.53	.18	.67	.16	.70
Grammatical Morphemes	1,2,5	118.7	(30.2)	118.2	7	123.6	(14.1)	121.3	5	113.6	(17.6)	116.0	13	104.6	(21.6)	105.0	15	.19	.66	1.18	.29	.84	.37
Elaborated Sentences	1,2,4	115.0	(25.3)	115.0	7	122.3	(30.7)	113.9	5	106.1	(23.3)	113.7	13	106.8	(17.2)	107.6	15	.17	.69	.70	.66	.11	.74
SPELT II																							
Raw Score	5,6	42.0	(6.3)	41.5	7	39.2	(7.3)	38.5	5	40.4	(7.1)	40.3	13	40.9	(9.4)	42.3	15	.04	.84	.26	.61	.89	.35
% Correct	4,5,7	84.0	(12.5)	81.9	7	78.4	(14.7)	77.6	5	80.8	(14.4)	80.5	13	81.9	(18.9)	85.0	15	.00	.98	.31	.58	.69	.41
%ile rank	5,6	65.6	(31.9)	63.1	7	50.2	(37.3)	47.5	5	50.8	(32.9)	50.4	13	63.9	(34.0)	69.6	15	.03	.87	.19	.66	2.52	.12

[◆] Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Personal/Social DQ; 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Total Score DQ; 7 = BDI Expressive Communication DQ.

[*] Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

[♣] Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

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Table 16.16

ANCOVA's on the Battelle Developmental Inventory at Posttest #2

		Continuing Cohort								Follow-up Cohort								By Treatment Group		By Cohort		By Group By Cohort	
		Clinic Based				Home Based				Clinic Based				Home Based									
Variable[*]	Covariates[◆]	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	p Value	ANCOVA F	p Value	ANCOVA F	p Value
Age of child as of 7/1/89		64.4	(4.8)		7	64.8	(4.6)		5	69.2	(5.4)		13	70.9	(6.4)		15	.26	.61	7.60	.01	.10	.75
Battelle Developmental Inventory (DQs)																							
Personal/Social	1,2,3	80.6	(16.9)	77.8	7	86.7	(26.2)	94.4	5	71.3	(13.1)	64.4	13	74.7	(14.5)	76.7	15	5.80	.02	7.32	.01	.18	.67
Adaptive Beh.	1,2,4	88.0	(19.1)	87.9	7	99.0	(14.7)	102.9	5	89.9	(12.7)	85.1	13	89.5	(13.7)	90.5	15	3.81	.06	2.44	.13	1.16	.29
Gross Motor	1,2,5	97.5	(13.4)	95.6	7	100.3	(13.6)	97.6	5	88.5	(17.0)	89.9	13	93.5	(13.8)	96.8	15	.77	.39	.43	.52	.31	.58
Fine Motor	1,2,6	91.6	(10.5)	88.3	7	94.6	(10.1)	93.6	5	84.0	(11.2)	86.7	13	86.3	(10.3)	87.9	15	.68	.42	.89	.35	.38	.54
Motor Total	1,2,7	93.0	(9.7)	89.6	7	95.9	(6.8)	94.0	5	84.9	(11.7)	87.5	13	88.3	(9.8)	91.1	15	1.63	.21	.63	.43	.02	.89
Receptive Communication	1,2,3	99.1	(17.3)	93.7	7	98.3	(17.6)	102.5	5	93.4	(16.8)	92.0	13	88.5	(16.8)	91.2	15	.48	.49	1.34	.26	.91	.35
Expressive Communication	1,2,8	91.3	(16.2)	92.7	7	79.2	(6.9)	75.4	5	78.9	(18.2)	82.9	13	79.7	(7.9)	80.1	15	3.59	.07	.26	.61	2.62	.12
Communication Total	1,2,8	94.4	(14.5)	93.1	7	87.7	(10.2)	87.6	5	83.7	(13.2)	83.8	13	82.6	(10.4)	84.0	15	.33	.57	2.28	.14	.51	.48
Cognitive Total	1,2,9	97.1	(13.2)	95.6	7	97.2	(11.0)	95.5	5	93.0	(13.5)	93.0	13	91.2	(10.0)	94.4	15	.03	.87	.19	.67	.03	.86
BDI Total	1,2,10	91.4	(12.3)	91.5	7	92.9	(11.1)	90.6	5	84.4	(11.2)	84.0	13	85.6	(8.8)	88.3	15	.25	.62	2.36	.13	.84	.37

[◆] Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Fine Motor DQ; 7 = BDI Motor Total; 8 = BDI Communication Total DQ; 9 = BDI Cognitive DQ; 10 = BDI Total

[*] Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

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Third posttest subgroup analysis by cohort. As can be seen in Table 16.17, no statistically significant interactions between treatment group and cohort were found on any of the main effects pertaining to speech and language functioning. Table 16.18 summarizes the subgroup analysis by group and by cohort on the Battelle. No statistically significant interactions were found on any of the domains of the Battelle. These findings suggest that the two combinations of duration of intervention and type of intervention produced comparable effects on speech, language and general development. Several statistically significant differences were found by cohort, always in favor of the follow-up cohort. This finding is understandable since the follow-up cohort was older and these analyses were performed on raw scores.

Conclusions

The findings of this study support the claims made by experts as early as 1948 (see Lillywhite, 1948), that mothers should not be excluded from the speech training of their speech delayed children. The combination of several elements (mothers as therapists, speech pathologists as parent trainers, and intervention in the home environment) appear to have contributed to language development for the subjects in this study. Even after three years, children in the home-parent training group performed at least as well as the children who received therapy directly from the speech pathologist in the clinic, and, in several cases, those trained by their mothers performed slightly better. While parents in each intervention appeared to value their respective interventions comparably (in monetary as well as more abstract terms), most parents in both groups continued to perceive the home parent training program as the treatment of preference. Therefore, the overall conclusion of this study is that the results of the third year follow-up corroborated with the posttest immediately following the first 7 months of intervention and the second year follow-up. Mothers were at least as effective, if not more effective than professional

Table 16.17

ANCOVA's on Speech and Language Measures at Posttest #3

		Continuing Cohort								Follow-up Cohort								By Treatment Group		By Cohort		By Group By Cohort	
		Clinic Based				Home Based				Clinic Based				Home Based									
Variable*	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	p Value	ANCOVA F	p Value	ANCOVA F	p Value
Age of child as of 7-1-89		76.4	(4.8)		7	76.8	(4.1)		6	81.2	(5.4)		13	83.3	(6.5)		14	.43	.52	8.90	.01	.19	.66
Goldman-Fristoe Sounds in Words # of errors	1,2,3	12.0	(4.4)	12.2	7	8.7	(10.8)	7.6	6	5.6	(6.0)	6.9	13	5.1	(5.3)	4.7	14	1.71	.20	2.81	.10	.26	.61
Goldman-Fristoe Sounds in Words %ile Rank	1,2,3	20.6	(14.9)	21.4	7	51.2	(37.8)	50.9	6	53.9	(32.6)	51.5	13	50.9	(34.6)	52.7	14	1.42	.24	1.81	.18	1.59	.22
TACL-R (DQs)+																							
Total	1,2,4	107.2	(11.9)	106.0	7	113.4	(12.3)	111.6	6	108.7	(15.2)	110.0	13	103.8	(13.2)	105.5	14	.01	.91	.05	.83	1.24	.27
Words, Classes & Relations	1,2,4	103.2	(12.7)	102.3	7	114.3	(13.9)	113.1	6	111.9	(16.8)	112.5	13	113.5	(14.4)	115.0	14	1.24	.27	1.11	.30	.65	.43
Grammatical Morphemes	1,2,5	123.8	(25.0)	121.9	7	114.8	(20.3)	112.5	6	110.0	(19.5)	113.8	13	106.2	(15.2)	106.6	14	1.46	.24	1.18	.28	.03	.86
Elaborated Sentences	1,2,4	102.9	(17.7)	102.7	7	118.2	(25.9)	115.6	6	105.3	(16.5)	107.3	13	101.4	(20.0)	101.3	14	.25	.62	.50	.48	2.07	.16
SPELT II																							
Raw Score	5,6	46.0	(2.6)	45.9	6	43.0	(5.9)	42.5	5	43.6	(6.3)	43.6	13	45.4	(3.2)	45.9	14	.10	.75	.12	.73	2.95	.09
% Correct	4,5,7	92.0	(5.2)	91.5	6	86.0	(11.9)	84.7	5	87.2	(12.6)	86.9	13	91.4	(6.4)	93.5	14	.00	.98	.40	.53	4.05	.05
%ile rank	5,6	78.3	(23.3)	78.2	6	65.6	(36.9)	65.6	5	63.5	(34.7)	63.5	13	74.5	(24.8)	78.4	14	.00	.95	.01	.93	2.17	.15

♦ Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Personal/Social DQ; 4 = BDI Cognitive DQ; 5 = BDI Communication Total DQ; 6 = BDI Total Score DQ; 7 = BDI Expressive Communication DQ.

* Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

+ Age equivalent scores from which DQs were calculated on the TACL-R represent averages computed from upper and lower limits of the age range provided in the test manual for each raw score.

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Table 16.18

ANCOVA's on the Battelle Developmental Inventory at Posttest #3

		Continuing Cohort								Follow-up Cohort													
		Clinic Based				Home Based				Clinic Based				Home Based				By Treatment Group		By Cohort		By Group By Cohort	
Variable*	Covariates♦	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	$\bar{x}$	(SD)	Adj $\bar{x}$	n	ANCOVA F	p Value	ANCOVA F	p Value	ANCOVA F	p Value
Age of child as of 7/1/90		76.4	(4.8)		7	76.8	(4.1)		6	81.2	(5.4)		13	83.3	(6.5)		14	.43	.52	8.90	.01	.19	.66
Battelle Developmental Inventory (DQs)																							
Personal/Social	1,2,3	110.4	(18.7)	109.0	7	102.4	(26.2)	101.8	6	98.8	(13.3)	100.4	13	105.3	(11.2)	105.8	14	.23	.64	3.09	.09	1.82	.18
Adaptive Beh.	1,2,4	101.8	(10.2)	102.3	7	97.6	(18.8)	95.8	6	102.3	(12.0)	104.4	13	101.0	(11.6)	100.2	14	1.10	.30	6.32	.02	.60	.44
Gross Motor	1,2,5	96.4	(13.2)	92.3	7	103.9	(13.5)	103.0	6	96.8	(12.4)	100.0	13	99.5	(9.0)	101.3	14	.66	.42	10.65	.00	.01	.93
Fine Motor	1,2,6	109.6	(12.5)	106.9	7	102.7	(22.8)	103.2	6	96.0	(12.9)	97.4	13	101.1	(12.4)	101.9	14	.04	.85	.35	.56	1.39	.25
Motor Total	1,2,7	99.6	(9.9)	99.5	7	100.4	(16.3)	96.7	6	94.1	(8.9)	96.5	13	98.9	(9.5)	100.2	14	.00	.96	3.43	.07	1.68	.20
Receptive Communication	1,2,3	102.8	(18.2)	100.7	7	106.4	(21.3)	102.7	6	101.9	(13.6)	107.3	13	102.1	(9.9)	102.4	14	.02	.89	4.33	.05	.00	.99
Expressive Communication	1,2,8	98.4	(19.2)	99.1	7	101.8	(21.6)	97.5	6	95.7	(13.8)	98.6	13	101.4	(11.9)	102.2	14	.35	.56	3.39	.08	.23	.64
Communication Total	1,2,8	97.0	(15.5)	96.1	7	102.1	(22.5)	99.3	6	94.9	(11.2)	98.2	13	99.2	(10.3)	99.7	14	.16	.69	4.16	.05	.12	.73
Cognitive Total	1,2,9	97.2	(10.3)	96.2	7	97.6	(6.7)	97.1	6	97.8	(10.6)	97.7	13	100.6	(9.0)	102.1	14	1.00	.33	7.42	.01	.73	.39
BDI Total	1,2,10	100.3	(7.4)	100.4	7	99.9	(14.5)	97.0	6	97.4	(6.9)	99.6	13	99.8	(7.1)	100.5	14	.13	.72	7.54	.01	1.83	.18

♦ Covariates: 1 = PSI Total Score; 2 = FACES Adaptability Subscales; 3 = BDI Receptive Communication DQ; 4 = BDI Adaptive Behavior DQ; 5 = BDI Gross Motor DQ; 6 = BDI Fine Motor DQ; 7 = BDI Motor Total; 8 = BDI Communication Total DQ; 9 = BDI Cognitive DQ; 10 = BDI Total

* Developmental Quotients (DQ) were calculated by dividing the age equivalent (AE) score reported in the technical manual for each child's raw score by the chronological age at time of testing and are reported here for purposes of interpretation. ANCOVAs were computed, however, using the raw score from which each DQ was derived.

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therapists in facilitating their child's development and remediating their child's speech disorders. These findings suggest that involving mothers in this way, especially for those who prefer this approach and who are of a similar socio-economic background as the subjects in this study, is an appropriate programming option (Eiserman, McCoun, & Escobar, 1990).

These findings support Wulz, Hall, and Klein's claim that the home environment is critical to generalizable language development, although the extent to which the effects observed here were primarily due to the environment in which the intervention was provided was not isolated. Similarly, these findings provide support to the phenomena Newport (1976) labeled "motherese" which refers to the tendency mothers have to respond to their child's intent rather than to the form of their communication. According to Newport, sensitivity to intent allows mothers to provide optimal linguistic cues to elicit and nurture the child's communication efforts. However, the extent to which the observed effects were due primarily to mother and therapists roles was not isolated. While isolating mothers from the home environment is not a reasonable possibility, providing speech pathologist-delivered therapy in the home environment is a reasonable way to determine how potent the home environment is in language development and should be addressed in future research.

Some educators and parents believe that redefining parents' roles to include teaching or providing therapy for their children puts undue strain on the parent-child relationships. The argument is, "It's demanding enough to be parents; don't expect them to be teachers as well" (e.g., Clarke-Stewart, 1982). It must be acknowledged that some parents with speech disordered children may not choose or welcome the opportunity of being trained as a speech paraprofessional for their children. In some cases, the added responsibility may result in excessive stress. In this study, however, statistically significantly higher levels of stress were not found in parents who provided therapy to their children. In fact, when given their choice, mothers in both interventions preferred the mothers-as-therapists intervention significantly more than the clinic-based approach.

The results of the cost analysis indicate that, excluding the value of parent time, there was no meaningful difference in cost between the two approaches. However, when we include the value of parent time as a real cost to the program, the high parent involvement program may cost over 20% more than the clinic-based program. From an economic perspective, which alternative is the most cost-effective is not clear. In general, those who operate programs that rely heavily on parent involvement need to understand the opportunity costs to parents. If parents are willing to pay the price (i.e., devote the required time and energy to training and intervention), then a home training program for speech impaired children, based upon the evidence presented here, may work as well or better than a clinic-based program staffed by a professional speech pathologist, and it may even be the most cost-effective alternative. However, in the present study, most mothers did not work outside the home, were not single and/or on welfare, and were well educated. In short, they chose to invest the time to participate. Obviously, this will not always be true. How validly this program's success could be generalized to a disadvantaged population is not known. For parents who already feel stress, a home training program requiring significant amounts of time and energy may not be as effective as a clinic-based program. Thus, the decision as to which alternative is "best" according to economic criteria is dependent upon the context of the intervention and can only be determined by those making the individual programming decisions, especially including parents. How to effectively involve parents in this decision making process is an area for future research.

The findings of this study provide a number of other implications for future research questions:

1. What, if any, are the long term benefits to parents who have been trained to work with their child? There is some evidence that involvement in their child's education may lead to a career change,

return to school, and an increased confidence in their economic self sufficiency (Gordon, Olmsted, Rubin, & True, 1979). An intensive examination of this in terms of the population examined in the present study as well as other populations is necessary.

2. To what extent do parents generalize their training to working with other children in their family or to other educational areas?

3. What is the experience of speech pathologist's who work with parents as opposed to those who work solely with children? To what extent do speech pathologists feel prepared to work as parent trainers and what, if anything, is needed to enhance their training to more effectively perform this function?

4. What are the continued longitudinal effects of the two interventions once both cohorts have entered school and are no longer receiving intervention? As the children get older it will become possible to more reliably examine constructs such as self-concept and social skills development.

Any conclusions that are eventually drawn about the most appropriate roles for parents and therapists in early intervention should be based on corroborating information empirically obtained via a variety of research strategies including quasi-experimental studies, single-subject studies, naturalistic inquiry, and experimental group studies. Experimental group studies, though one of the most valuable research strategies for comparing the effects of alternative interventions, have not been adequately employed to assess the effects of programmatic alternatives in early intervention. This study has addressed many of the weaknesses of previous research in this area by using a randomized experimental design, naive diagnosticians, and a wide variety of standardized measures focusing, longitudinally, on both child and family functioning. Any research which follows should reflect further refinements in methodology and address research questions which are the most relevant to the field.

UTAH PARENT INVOLVEMENT STUDY (1985)

Project #17

Comparison: Moderately to Severely Handicapped Children--Center-based only intervention plus parent training versus center-based only intervention only.

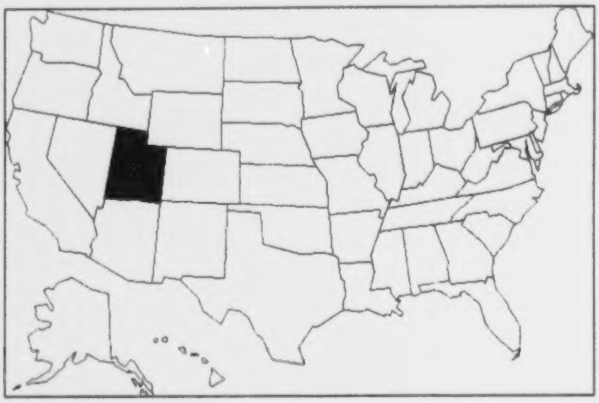
Local Contact Person: Don Link, Director, Developmental Disabilities, Inc.

EIRI Coordinator: Glenna Boyce, Ph.D.

Location: Salt Lake City, Utah

Date of Report: 4-10-1991

Rationale for Study



One of the most frequent claims of researchers, administrators, and practitioners is that parent involvement in early intervention produces better results for children than no parental involvement (Bronfenbrenner, 1974; Garland, Swanson, Stone, & Woodruff, 1981; Johnson & Chamberlin, 1983; Karnes & Lee, 1978; Lazar, 1981; Parker & Mitchell, 1980; Simeonsson, Cooper, & Scheiner, 1982). In an examination of reviews of early intervention literature, the most frequently cited concomitant variable was parental involvement. Virtually all previous reviewers who have examined the benefits of involving parents in early intervention programs have concluded that parental involvement is associated with increased benefits for children (see White et al., 1985-86).

Although the claim that parent involvement is beneficial for children is widely accepted, there is little empirical evidence to support this view. Relatively few studies have used the experimental method to test the notion that parental involvement is more effective than no parent involvement, and many of these studies had methodological limitations (see White, Taylor, & Moss, 1989). Even fewer studies have used random assignment of subjects to differing treatment conditions. Lack of random assignment in early intervention research is largely due to the ethical concerns of offering treatment in a random manner. White and Pezzino (1986) have addressed the validity of such concerns and concluded that the infrequent use of randomization has been a serious impediment to the advancement of knowledge about the efficacy of early intervention. They argue that such designs are feasible to implement and, if properly conducted, are neither unethical nor illegal. The use of methodologically well-designed studies which includes random assignment of subjects is one of the best ways of determining whether there are benefits associated with involving parents in early intervention programs.

Another problem in assuming that parent involvement is always beneficial is that there are many types of parent involvement programs with probably many variations in consequent effects. Care must be used in generalizing the benefits (or effects) of one type of parent involvement program to other types of parent involvement. The term "parent involvement" is perhaps too global a term. More specific terms are needed to identify variations of parent involvement. Furthermore with the varieties of "parent involvement", one study (even if it is methodologically sound) cannot answer the question of the effectiveness of parent involvement. A series of studies are needed to answer this question and build a sound base of information concerning the benefits of parent involvement.

This study investigated a typical parent involvement program by investigating the immediate and long-term effects of the addition of one type of a parent involvement program to an already existing center-based only intervention program for the children. The parent involvement was primarily designed to improve parent's skills as teachers of their child with handicaps, but it also included an information component and a support component for the parents.

In addition to assessing the impact of this particular type parent involvement program with child progress measures, this study assessed the possible changes that such a program had on the family. The work of several investigators has suggested a link between child management skills and family functioning (e.g., Koegel, Schreibman, Britten, Burke, & O'Neil, 1982; Patterson, 1979; Patterson & Fleishman, 1979; Wahler, Leske, & Rogers, 1979); however, additional research is needed to determine the nature of these effects. Additionally, most previous studies were conducted with disadvantaged children; children with moderate and severe handicaps may present sufficiently different problems so that the relationship between behavioral parent instruction and overall family functioning may not be present or at least may be different.

Review of Related Research

The involvement of parents in their children's education has long been considered important. White et al. (1989) identified six rationales frequently used for why parental involvement is necessary: (1) Parents are responsible for the welfare of their children; (2) Involved parents provide better political support and advocacy; (3) Early intervention programs which involve parents are more effective; (4) By involving parents, the same outcome can be achieved at less cost; (5) The benefits of early intervention are maintained better if parents are involved; and (6) Parent involvement provides benefits to parents and family members as well as the child.

While these rationales for parent involvement would appear to be logical and sensible, the evidence from the research to date on parent involvement is less than conclusive. Table 17.1 presents the White et al. (1989) analyses of 12 studies that examined the effects of adding a parent involvement component to early intervention

Table 17.1

Effects of Adding a Parent Involvement Component to Early Intervention Studies with Handicapped Children

Reference	Description of the Comparison	Quality	Primary Focus Parental Involvement	Secondary Focus Parental Involvement	Effect Size
Direct Comparisons of Benefits of Parent Involvement:					
Barnett, Escobar, & Ravsten, 1987	Center and home intervention vs. center intervention	fair	Parent as therapist	---	.26
Henry, 1977	Daycare program plus parental vs. daycare program alone	fair	Parent as therapist	---	.72
Minor et al., 1983	Center-based only intervention plus parental involvement vs. center-based only intervention alone	poor	Parent as therapist	---	2.21
Miller, 1981	Preschool developmental class plus at-home program vs. preschool developmental class alone	poor	Parent as Therapist	Parent/child relations Emotional support Resource Access	.16
Scherzer, 1976	Physical therapy plus parent training vs. physical therapy alone	poor	Parent as therapist	---	.50
Indirect Comparisons of Benefits of Parent Involvement:					
Bidder et al., 1975	Parents as therapists vs. home-based intervention by health care professional	good	Parent as therapist	Emotional support	1.07
Barnett, Escobar, & Ravsten, 1987	Home-based intervention by parents vs. center-based only intervention	fair	Parent as therapist	---	.19
	Center plus home-based interventions home intervention	fair	Parent as therapist	---	.15
Shelton, 1978	Reading to children by parents vs. traditional nursery school	fair	Parent as therapist	---	.05
Goodman et al., 1984	Hospital-affiliated program plus parental involvement community daycare programs alone	poor	Parent as therapist	Emotional support	.51
Allen et al., 1980	Parent-child interaction intervention vs. traditional intervention	poor	Parent/child relations	Parent as therapist Emotional support	.90
Horton, 1976	Hearing aid before the age of 3 plus parental involvement vs. hearing aid alone	poor	Parent as therapist	Sensory stimulation Emotional support Child Develop. Educ.	.83
Kysela et al., 1981	Extensive home-based training to parent vs. center-based only intervention to child with moderate parental involvement	poor	Parent as therapist	---	-.42

for children with handicaps. First, various types of program comparisons have been made to address different research questions about parent involvement. For example, some of the research designs have compared home-based, parent intervention with center-based only intervention, asking which is better--home-based parent or center-based only professional intervention. Others have compared a center-based only intervention with the same center-based only intervention to which has been added a parent involvement component, asking whether or not the addition of parent involvement will make a significant contribution to the child's development. It is logical to expect different findings when different comparisons are made. In 1985, when this study was initiated, center-based only programs adding a parent-as-therapist component was a popular and frequently-used intervention program. Since evidence did not exist as to the benefits of this type of parent involvement, and since it was so frequently used, this type of design was a logical choice to be evaluated.

Second, various methodological problems have been found in the research. Table 17.1 addresses the issue of study quality. "Study quality" refers to the assessed threat to internal validity for that particular study. (For further information concerning the manner in which these studies were rated, see the final report of the Early Intervention Research Institute, 1987.) None of the studies which used direct comparison were rated any better than "fair," indicating that serious methodological concerns characterize this literature. One good study indirectly compared the benefits of parent involvement. However, indirect comparisons (that is, a comparison in which parent involvement is one of several variables, such as setting or age-at-start, which are experimentally manipulated) are generally so confounded as to give little information on the effectiveness of parent involvement. Given the weaknesses of the studies and the lack of positive effects shown in Table 17.1, the alleged benefits of parent involvement in early intervention programs have not been well documented.

Furthermore, other important questions have not been addressed in the research. One question which needs addressing is the relationship between parental child management skills and family functioning. Several investigators have suggested such a link (e.g., Koegel et al., 1982; Patterson, 1980; Patterson & Fleishman, 1979; Wahler et al., 1979). However, additional research is needed to determine the nature of these effects; they might be positive or negative. Clarke-Stewart (1982) suggested that perhaps parent involvement programs may serve to make the mother more anxious or unsure, and failure to measure maternal variables would obscure this result. Second, few studies provide cost-benefit information, despite general claims that parent involvement saves money. Third, none of the studies report data from follow-up testing. Since studies involving disadvantaged children have cautiously suggested that some benefits due to parent involvement may be long-lasting (Haskins & Adams, 1982), the importance of longitudinal research in this area becomes obvious. Thus, the goal of this research was to determine immediate and delayed impact of adding a structured parent involvement program to an existing center-based only early intervention program that provided minimal parent involvement.

Overview of Study

Fifty-one children with moderate and severe handicaps were randomly assigned to a center-based early intervention program plus parent involvement or a center-based only intervention alone. Treatment was provided at two early intervention centers located in the greater Salt Lake City, Utah area. All children were involved in a 3-hour, 5-day-per-week, center-based only preschool program. Mean age of the children at the beginning of the intervention was 46.1 months. The children were randomly assigned to one of two groups, the center-based only group or the center-based plus parent involvement group. Although the children were in different groups for the research analyses, they were mixed together in classrooms at the centers.

The parents of the "center-based plus parent involvement group" attended parent instructional workshops provided one time per week (90 minutes) for 15 weeks during the winter months of 1986, in addition to the regular parent functions at the centers. The Parents Involved in Education (PIE) curriculum was used in the workshops. The parents in the "center-based only" group continued to be included in the regular parent functions provided by the centers. All children and parents (usually mothers) were tested prior to, immediately after, and one, three, and four years following the implementation of the parenting groups. Results were determined through use of analysis of variance and analysis of covariance, with respective pretests and mother education as covariates.

Method

Subjects

Fifty-one children with moderate and severe handicaps were included in the study with the average developmental quotient of 55 (BDI total developmental age ÷ chronological age x 100). In the remainder of this section, the procedures for recruiting subjects and assigning them to groups will be summarized. The demographic characteristics of children in each group will be discussed, and the effect of subject attrition will be summarized.

Recruitment. Preschool children, and their families, who were participating in classes taught at the two centers, were considered for inclusion in this study. The Battelle Developmental Inventory (Newborg et al., 1984) was used to determine children's eligibility for services. To be eligible for services, children had to score at least 1.5 standard deviations below the mean in at least two areas, or 3 standard deviations below the mean in one area. Parents of these children were sent a letter inviting them to participate in the research, and inclusion in the study was based on parents' willingness to participate without prior knowledge of treatment group assignment. Subject recruitment for this cohort was completed in November 1985.

Assignment to groups. Children who met the criteria for inclusion were randomly assigned to one of two treatment groups; their parents accordingly were assigned either to a group in which they received instruction in parent workshops or to a group in which parents did not attend parent workshops. The group not receiving the additional parent involvement component continued to receive the same center-based intervention previously available.

To increase the probability of having comparable groups, children were assigned to groups randomly after being stratified as follows. Within each of the teachers' classes, subjects were categorized according to chronological age (22-34 months, 35-47 months, and over 48 months) and level of parent motivation (low or high) as perceived by each child's teachers. Stratifying subjects in this way resulted in subjects falling into one of six mutually exclusive cells. Within each of the six cells, subjects were rank ordered from low to high based on their DQ test scores obtained from a number of assessment instruments previously administered as part of the eligibility process for receiving services at the centers.

After subjects were categorized, they were alternately assigned to one of the two conditions. Group determination for the subject with the lowest DQ score, in each age by motivation cell was accomplished randomly. Additional subjects within the same category were then alternately assigned to groups.

Demographic characteristics. In this total sample of developmentally delayed preschoolers there were more boys than girls with 63% of the sample being boys. They were, on the average, almost four years old at the start of the study. The children were primarily white and all but one spoke English in the home. Most of them lived in intact families with parents who were in their early thirties. The average number of siblings of the child in the study was just over two. The mothers had an average of 13 years of education and fathers an average of almost 15 years of education. The average income and occupational level indicates that this was a sample of middle-class families. Few of the mothers worked outside the home at the start of the investigation.

At the end of the five-year study, the major demographic change was that more mothers now reported working. The mothers now reported an average of 14 hours per week instead of an average of 5 hours per week. The incomes were higher at Posttest #4, but the increase was probably due in part to inflation. The average increase was approximately $6,000. The number of siblings also increased slightly, but still only averaged between 2 and 3 siblings per family in addition to the child with handicaps. Other than these changes, the characteristics of the sample remained stable over the five years of the study.

Between the two randomized groups few significant differences in demographic characteristics were found. Table 17.2 shows the comparison of the center-based only group versus center-based plus parent involvement group on a number of demographic variables at the time of pretest. Children in the center-based only group had a statistically significantly higher number of siblings (p = .02), and their mothers had a statistically significantly higher level of education (p = .01) than participants in the center-based plus parent involvement group.

Attrition. Two subjects were lost between the pretest and first posttest (one in each group). The subject in the center-based only group was recruited back into the study and participated in Posttests #2, #3, and #4. Nine subjects were not tested at Posttest #2. Six were in the center-based only group and three were in the center-based plus parent involvement group. Attrition was due to subjects moving where there were no testers, parent's decision not be included, or subjects moving

Table 17.2

Comparison of Key Demographic Pretest Variables of the Center-based only and Center-Based Plus Parent Involvement Groups of the 1985 Parent Involvement Study

	Center-Based Only			Center-based + PIE				
	x̄	(SD)	n	x̄	(SD)	n	p Value	ES[^]
• Child age in months	46.4	8.2	25	45.7	9.9	26	.78	-.09
• Percent male[*]	56		25	69		26	.34	.25
• Mother education	14.1	2.0	25	12.7	1.8	26	.01	-.70
• Father education	14.8	2.1	24	14.5	1.9	26	.57	-.14
• Family Income[$]	$28,333	$15,588	24	$29,134	$15,896	26	.86	.05
• Mother age	33.5	5.9	25	31.5	4.7	26	.19	-.34
• Father age	34.3	6.9	25	33.4	5.0	26	.62	-.13
• Percent Caucasian[*]	72		25	62		26	.47	-.20
• Number of Siblings	2.6	1.4	25	1.8	1.0	26	.02	-.57
• Percent intact families[*]	95.7		23	92		25	.71	-.10
• Hours per week mother employed	3.2	7.5	25	7.4	12.6	26	.16	.56
• Hours per week father employed	42.3	4.5	23	40.4	2.0	25	.07	-.42
• Percent fathers employed as technical/managerial or above[*]	65.2		23	48		25	.26	-.32
• Percent mothers employed as technical/managerial or above[*]	8.0		25	12.0		25	.69	.11
• Percent w/English as primary language[*]	96		25	100		26	.55	.17

[*] Statistical analyses for these variables were based on a t-test where those children or families possessing the trait or characteristic were scored "1," and those not possessing the trait were scores at "0."

[$] Income data was converted from categorical to continuous data by using the midpoint of each interval.

[^] Effect size (ES) is defined here as the difference between the groups (Center-based + PIE minus Center-Based Only) on the ANCOVA scores, divided by the unadjusted standard deviation of the Center-Based Only group (see Cohen, 1977; Glass, 1976; & Tallmadge, 1977, for a more general discussion of the concept of Effect Size). The sign of ES only indicated direction of difference; no value judgment is intended.

without forwarding addresses. In an effort to contact the latter group, phone calls were made to next of kin and certified letters were sent to the subject. However, these subjects could not be contacted in spite of our best efforts.

At posttests #3 and #4, some of the subjects were recovered and 46 subjects were tested at each posttest. The five not tested were not the same five for the two posttests, but each time three subjects were from the center-based plus parent involvement group and two were from the center-based only group. No significant differences were found in the pretest demographic variables between those who were tested and those who were not at posttests #2, #3, or #4 (See Tables 17.3 - 17.5).

Table 17.3

Comparison of Pretest and Demographic Variables of Subjects Who Withdrew From The Study with Those Who Completed Posttest #2 at the 1985 Utah Parent Involvement Study

								Study Status							
		Center-based Only			Center-based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES^*
Child Age at Pretest	IN	45.8	8.2	19	47.3	9.3	23	46.6	8.7	42	43.4	10.5	9	.34	.37
	OUT	48.4	8.6	6	33.5	5.8	3								
Battelle Total	IN	56.1	18.1	19	55.2	12.3	23	55.6	15.0	42	53.8	14.1	9	.74	.12
	OUT	55.6	14.8	6	50.2	14.6	3								
Total Parent Stress Index	IN	262.6	44.8	18	265.0	56.6	23	264.0	51.2	41	243.8	21.9	9	.26	.39
	OUT	238.3	22.7	6	254.7	19.1	3								
Child Related PSI	IN	124.9	20.9	18	125.4	28.4	23	125.2	25.1	41	118.8	12.1	9	.46	.25
	OUT	116.2	12.7	6	124.0	11.0	3								
Other PSI	IN	138.2	29.3	18	137.7	31.5	23	137.9	30.2	41	125.0	13.9	9	.22	.43
	OUT	122.2	14.4	6	130.7	13.8	3								
Education Mother	IN	13.8	2.0	19	12.7	1.9	23	13.2	2.0	42	14.2	1.7	9	.17	-.50
	OUT	14.8	1.7	6	13.0	1.0	3								
Education Father	IN	14.6	2.4	18	14.6	1.9	23	14.6	2.1	41	14.7	1.8	9	.94	-.05
	OUT	15.3	1.2	6	13.3	2.3	3								
Income	IN	$28,249	$15,900	18	$29,826	$16,195	23	$29,134	$15,885	41	$27,000	$14,942	9	.71	.13
	OUT	$28,583	$16,064	6	$23,833	$15,011	3								

Table 17.4

Comparison of Pretest and Demographic Variables of Subjects Who Withdrew From The Study With Those Who Completed Posttest #3 at the 1985 Utah Parent Involvement Study

								Study Status							
		Center-based Program			Center-based + PIE			In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p* Value	ES^*
Child Age at Pretest	IN	46.7	8.4	23	46.5	9.1	23	46.6	8.7	46	40.9	11.8	5	.18	.66
	OUT	42.9	3.6	2	39.6	16.3	3								
Battelle Total	IN	56.4	17.7	23	54.5	11.6	23	55.4	14.9	46	54.0	14.9	5	.83	.09
	OUT	51.2	.1	2	55.8	20.7	3								
Total Parent Stress Index	IN	257.5	43.1	22	262.7	50.1	23	260.2	46.4	45	261.8	65.2	5	.94	-.03
	OUT	245.0	7.1	2	273.0	89.5	3								
Child Related PSI	IN	123.1	20.1	22	123.9	24.9	23	123.5	22.4	45	128.6	33.4	5	.65	-.23
	OUT	118.0	5.7	2	135.7	45.0	3								
Other PSI	IN	134.9	28.0	22	136.8	28.8	23	135.9	28.1	45	133.2	32.7	5	.84	.10
	OUT	127.0	12.7	2	137.3	44.6	3								
Education Mother	IN	14.0	2.1	23	12.7	1.9	23	13.4	2.1	46	13.6	1.1	5	.81	-.10
	OUT	14.5	.7	2	13.0	1.0	3								
Education Father	IN	14.7	2.2	22	14.3	2.0	23	14.5	2.1	45	15.6	.9	5	.25	-.52
	OUT	16.0	.0	2	15.3	1.2	3								
Income	IN	$26,931	$15,145	22	$28,847	$15,259	23	$27,911	$15,061	45	$36,300	$20,102	5	.26	-.56
	OUT	$43,750	$15,910	2	$31,333	$24,271	3								

* p value and effect size (ES) are based on comparison of study status (i.e., in study, those who were tested at that posttest vs. out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference, no value judgment is intended.

^ $ES = \frac{\bar{X}_{in} - \bar{X}_{out}}{SD_{in}}$

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Table 17.5

Comparison of Pretest and Demographic Variables of Subjects Who Withdrew from the Study With Those Who Completed Posttest #4 at the 1985 Utah Parent Involvement Study

		Center-based Only			Center-based + PIE			Study Status							
								In Study			Out of Study				
Variable		$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	$\bar{x}$	SD	n	p^* Value	$ES^{\wedge *}$
Child Age at Pretest	IN	46.74	8.42	23	45.36	8.96	23	46.05	8.63	46	46.15	13.51	5	.98	-.01
	OUT	42.86	3.55	2	48.35	18.46	3								
Battelle Total	IN	56.42	17.73	23	54.15	11.38	23	55.29	14.77	46	55.40	15.92	5	.99	-.01
	OUT	51.17	.08	2	58.23	21.84	3								
Total Parent Stress Index	IN	257.55	43.12	22	263.74	47.93	23	260.71	45.23	45	256.8	73.34	5	.85	.09
	OUT	245.00	7.07	2	264.67	102.47	3								
Child Related PSI	IN	123.14	20.14	22	124.48	23.80	23	123.82	21.85	45	128.5	37.65	5	.86	-.21
	OUT	118.0	5.66	2	131.0	52.12	3								
Other PSI	IN	134.86	28.04	22	137.30	27.94	23	136.11	27.69	45	131.00	36.39	5	.71	.18
	OUT	127.0	12.73	2	133.67	50.40	3								
Education Mother	IN	14.04	2.06	23	13.0	1.48	23	13.52	1.85	46	12.20	3.11	5	.16	.71
	OUT	14.50	.71	2	10.67	3.22	3								
Education Father	IN	14.68	2.19	22	14.52	1.93	23	14.6	2.04	45	14.80	1.79	5	.83	-.10
	OUT	16.0	.00	2	14.0	2.0	3								
Income	IN	$26,931	$15,145	22	$30,260	$16.124	23	$28,633	$15,566	45	$29,800	$17,648	5	.88	-.07
	OUT	$43,750	$15,910	2	$20,500	$13,115	3								

[*] p value and effect size (ES) are based on comparison of study status (i.e., in study, those who were tested at that posttest vs. out of study, those who were not tested at that posttest). The sign of ES only indicates direction of difference, no value judgment is intended.

$$\wedge \quad ES = \frac{\bar{X}_{in} - \bar{X}_{out}}{SD_{in}}$$

In sum, the results demonstrated that the children, comparing those who were tested with those who were not at Posttests #2, #3, and #4 were very similar in age and development at pretest. Likewise, the parents who were tested at each posttest were very similar to those who were not.

Intervention Program

This section will briefly describe the treatments for the center based only and the center-based plus parent involvement groups and will discuss treatment verification measures.

Basic Intervention (center-based only treatment). Children in both groups received the same center-based intervention services during the program year. All children were enrolled in a 3-hour, 5-day-per-week center-based intervention program in which they received small group and individualized teaching sessions from certified special education teachers and trained paraprofessional aides. Certified therapists provided individual motor and speech/language instruction to the children and helped teachers implement appropriate activities in these and other developmental areas. Instructional activities were developed from comprehensive assessments and were drawn from a number of curricula. Children were grouped into classrooms based on level of developmental functioning, and the average number of children per classroom was slightly less than ten. The child:teacher ratio was 3.6 to 1. During a typical day, children were instructed in developmental areas such as motor, speech/language, self-help, cognitive, and social skills. As part of these basic services to children, parents were involved in IEP meetings, and teachers occasionally talked individually to parents regarding their child's program as children were dropped off or picked up at the preschool.

Expanded intervention (center-based plus parent involvement). In addition to the center-based treatment described above, the parent involvement group participated in parent workshops which used the Parents Involved in Education (PIE) (Pezzino & Lauritzen, 1984) instructional package. PIE instructional curriculum included the following: (1) introduction and overview, (2) objective observation of child behavior, (3) defining and measuring behavior, (4) principles of behavior management, (5) analyzing behavior chains, (6) theories of child development, (7) testing and assessment, (8) criterion-referenced assessment, (9) developing learning objectives, (10) P.L. 94-142 and IEPs, (11) intervention strategies, (12) factors related to teaching success, (13) practice teaching session, (14) determining appropriate interventions, (15) communicating with professionals, (16) stress management, and (17), review, comments, concerns, and questions.

The PIE instructional sessions were taught by a social worker and the director of one of the centers. The average group size consisted of between 8 and 12 parents.

Workshops sessions consisted of 15 ninety-minute sessions, once per week excluding holidays, for a period of four months. In association with the lesson material presented, at most of the sessions parents were asked to choose target behaviors of their child (either from IEPs or one of their own choosing). They taught how to plan an intervention program based on behavior management principles and to carry the program out during the week. They were asked to keep track of and report the time spent in these activities. As can be seen in the list of topics above, information was included concerning principles of child development and government concerns with programs for children with handicaps. Finally, at each session, time was allotted for parents to form support networks and discuss challenges associated with parenting a child with a handicap.

Treatment verification. Three methods of treatment verification were used. First, parent attendance was kept at the parent instructional sessions. Parent attendance at the parent instructional sessions averaged 78%, an excellent attendance record for a program of this nature. Second, at Posttest #1, a test of knowledge based on the PIE curriculum was given. The test of parent knowledge, given to both the parent instruction and the center-based only groups at the time of the first posttest, showed a significant difference in favor of the parent instruction group (p =.01). These findings support the claim that the treatment was received by the parents as it was intended, and that parents gained the knowledge presented in the PIE instructional package.

Cost of alternative interventions. It is important to determine the cost of adding this type of parent involvement component to an already established center-based program. Should costs be high and relative benefits be low, money used to establish the parent program might be better spent elsewhere. Costs of implementing a parent involvement program like that used in this study were estimated based on a similar program offered the following year at the same center. All aspects of the program on which the cost data were based were the same (i.e., number of sessions held, the people conducting the sessions, and the approximate number of participants). Figures were adjusted for inflation and are in 1990 dollars. See Table 17.6 for a summary of this analysis. In addition, the total costs of program and contributed resources were discounted using discount rates of 3% and 5%. Discounting adjusts the costs for the real rate of return that the program expenditure may have earned had the money been invested elsewhere. Inflation adjusts for only the nominal changes in money over time.

Table 17.6

Cost Per Child for the 1986 Utah Parent Involvement Study (1990 Dollars)

Resources	Center-based only	Center-based + PIE
1. **UNDISCOUNTED**		
Agency Resources		
Direct Service	$3,153	$3,334
Administration	608	640
Occupancy	694	694
Equipment	89	89
Transportation		
Children	10	10
Staff	7	7
Materials/Supplies	51	58
Miscellaneous	30	30
SUBTOTAL	**$4,642***	**$4,862***
Contributed Resources		
Volunteer time	25	25
Parent time	416	1,208
Parent Transportation	1,306	1,383
Miscellaneous	2	2
SUBTOTAL	**$1,749**	**$2,618**
Total	***$6,391****	***$7,480****
2. **DISCOUNTED (3%)**		
Agency Resources	$5,071	$5,312
Total Resources	6,984	8,171
3. **DISCOUNTED (5%)**		
Agency Resources	5,373	5,627
Total Resources	7,398	8,657

* Totals may not add up due to rounding errors

The direct cost for the center for each child in the parent involvement program group, over that which was spent for each child at the center was approximately $200. Therefore, the addition of this type of parent involvement program to an existing center program is relatively inexpensive. When a value was placed on parent volunteer time in attending instructional sessions, the cost for each child in the parent involvement group was approximately $1000 more than for each child in the center-based only group.

Data Collection

Data collection procedures involved the recruitment, training, and monitoring of diagnosticians, and administration of pretests, and posttests. The measures used to obtain data on the children and their families, and the tests at which they were used, are listed in Table 17.7. Brief descriptions of these instruments are presented in Table 17.8.

Recruitment, training, and monitoring of diagnosticians. Diagnosticians were recruited from graduate programs in psychology and special education at Utah State University. All had masters degrees and extensive experience assessing infants and children with handicaps. They were trained through a lengthy process which involved observation of videotapes, a two-day training seminar, and required certification after administering at least three Battelles. Although these diagnosticians were aware that research was being conducted, they were uninformed as to the specific details and hypotheses of the study. They were also unaware of the children's assignments to groups. Shadow scoring was conducted on 10% of the administrations to ensure the validity of the testing procedure, and administration of the Battelle was determined to be reliable between testers more than 90% of the time.

Pretest. Pretesting took place in late October and early November, 1985. Parents of each child participating in the study completed an informed consent form

Table 17.7

Schedule of Administration and Test Administration for Utah Parent Involvement 1985 Study

Instruments	Pretest	Posttest #1	Posttest #2	Posttest #3	Posttest #4
CHILD MEASURES					
Battelle Developmental Inventory	X	X	X	X	
Woodcock-Johnson Test of Achievement--Revised					X
Scales of Independent Behavior					X
Stanford-Binet Intelligence Test, Form L-M*	X				
Developmental SPECS					X
Bayley Scale of Infant Development	X				
Minnesota Child Development Inventory	X	X			
Report of Child's Health			X	X	X
Sequenced Inventory of Communication Development	X				
FAMILY MEASURES					
Parent Stress Index	X	X	X	X	X
Family Support Scale		X	X	X	X
Family Resource Scale		X	X	X	X
Family Inventory of Life Events and Changes		X	X		
Family Adaptation and Cohesion Scale		X	X	X	X
Child Improvement Questionnaire		X			
Family Environment Scale		X			
Home Screening Questionnaire		X			
Parent/Child Interaction					X
Public School Teacher Evaluation			X		X

Table 17.8

Description of Tests Administered for Utah Parent Involvement 1985 Study

MEASURES	DESCRIPTION
CHILD MEASURES	
Battelle Developmental Inventory (BDI) (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984)	A norm-referenced test of developmental functioning completed through child administration and parent interview. Assesses Personal/Social, Adaptive, Motor, Communication, and Cognitive Skills, and provides a total score.
Woodcock-Johnson Tests of Achievement--Revised (Woodcock & Johnson, 1989)	A norm-referenced test of achievement. The test consists of nine aspects of scholastic achievement: Letter-word Identification, Passage Comprehension, Calculation, Applied Problems, Dictation, Writing Samples, Science, Social Studies, and Humanities.
Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman, & Hill, 1985)	The SIB is a norm-referenced test which assesses the functional independence and adaptive behavior of a child. The test is organized into four subdomains: Motor Skills, Social and Communication Skills, Personal Living Skills, and Community Living Skills.
Stanford-Binet Intelligence Test Form L-M (Terman & Merrill, 1973)	The Stanford-Binet is a norm-referenced measure of general intellectual ability.
Developmental SPECS (System to Plan Early Childhood Services) (Bagnato & Neisworth, 1990)	Assesses adult perceptions (judgment-based assessment) of child capabilities on 20 developmental dimensions that encompass six domains: Communication, Sensorimotor, Physical, Self-Regulation, Cognition, and Self-Social.
Bayley Scales of Infant Development (Bayley, 1969)	Assesses infants from age 2 months to 2½ years. This well standardized test includes a Mental Scale, Motor Scale, and Infant Behavior Record.
Minnesota Child Development Inventory (MCDI) (Ireton & Thwing, 1974)	Assesses child development in eight areas: General Development, Gross Motor, Fine Motor, Expressive Language, Comprehension-Conceptual, Situation Comprehension, Self-Help, and Personal/Social
Report of Child's Health	Assesses child's health for the previous year. Questionnaire designed by EIRI specifically for this research. Technically, this measure is not an outcome measure, but it allows for the measurement of child's illness which may affect the other child outcome measures.
Sequenced Inventory of Communication Development (Tobin, 1984)	The Sequenced Inventory of Communication Development assesses Receptive and Expressive language development of young children ages 4 to 48 months.
FAMILY MEASURES	
Parent Stress Index (PSI) (Abidin, 1983)	Assesses parent perceptions of stress on the parent-child system. The two main domains are child-related factors and parent factors and parent factors.
Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984)	Assesses the availability of sources of support as well as the degree to which different sources of support provided are perceived as helpful to families rearing young children.
Family Resource Scale (FRS) (Dunst & Leet, 1985)	Assesses the extent to which different types of resources are perceived as adequate in households with young children. Factors include: General Resources, Time Availability, Physical Resources, and External Support.

(continued)

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Table 17.8 (continued)

Description of Tests Administered for Des Moines Parent Involvement Study

MEASURES	DESCRIPTION
Family Inventory of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983)	Assesses life events and changes experienced by a family unit during the past 12 months and prior to the past 12 months. The specific areas of potential strain covered by the scale include: Intra-Family, Martial, Pregnancy and Childbearing, Finance and Business, Work-Family Transitions, Illness and Family "Care," Losses, Transitions "In and Out," and Legal.
Family Adaptation and Cohesion Evaluation Scale - III (FACES) (Olson, Portner, & Lavee, 1985)	Provides a general picture of family functioning by assessing the family's level of adaptability and cohesion. Family cohesion assesses degree of separation or connection of family members to the family. Adaptability assesses the extent to which the family system is flexible and able to change in various situations. The scale also has a perceived as well as ideal form that provides an indication of the extent to which current family functioning is consistent with the family's expectations for ideal family functioning.
Child Improvement Questionnaire--Revised (Devellis, Revicki, & Bristol, 1985)	The questionnaire has been adapted from the Child Improvement Locus of Control (CILC). The CILC assesses parental perceptions of factors that affect the progress of their developmentally impaired child. Factors assessed are: chance, efforts by professionals, the child's efforts, parent efforts, and divine intervention.
Family Environment Scale (FES) (Moos, 1974)	Assesses general family functioning in 10 areas: Cohesion, Expressiveness, Conflict, Independence, Achievement Orientation, Intellectual-Cultural Orientation, Active Recreation Orientation, Moral-Religious Emphasis, Organization, and Control.
HOME Screening Questionnaire (Coons, Gay, Standall, Ker, & Standal, 1981)	Based on the HOME, devised by Caldwell and Bradley, this screening test was developed as an instrument to identify families that may require further evaluation in order to assist their children.
Parent/Child Interaction (EIRI, 1986)	Observational (videotaped) measure of parent/child interaction following an outlined protocol designed by EIRI staff.
Public School Teacher Evaluation (EIRI, 1988)	Teacher assessment of parent's participation in child's educational program and information concerning child's educational placement.

and were interviewed using the demographic survey. In the first of two pretesting sessions, children were administered the Battelle Developmental Inventory (BDI) (Newborg et al., 1984), a measure of the child's developmental level. Since this study was one of the pilot studies, intelligence tests were administered along with the BDI. Either the Stanford-Binet (Form L-M, 1960) or Bayley Scales of Infant Development (Bayley, 1961) was given depending on the age and developmental level of the child. The Minnesota Child Development Inventory (Ireton & Thwing, 1974), a parent report of child development was filled out by the mother. The MCDI includes gross and fine motor, expressive language, comprehension, self-help and personal-social subscales. The BDIs were administered by a trained examiner who was unaware of the child's group assignment. Testing occurred at the centers. In

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a second pretesting session, which usually took place within two weeks of the BDI test session, parents (usually the mother) completed a demographic survey and the Parenting Stress Index (Abidin, 1983) (which measures stress and coping behavior in the parent-child system). Information pertaining to the reliability and validity of the Battelle and the Parent Stress Index may be found in the first annual report (White and Casto, 1986). Each of these two sessions lasted approximately 1½ hours. Parents were paid a $20 incentive after both pretesting sessions were completed.

Posttest #1. Posttesting occurred at the end of the school year in 1986 during the last two weeks of May and the first week of June, or approximately 7.5 months after pretesting occurred. The posttest battery took three test sessions to administer. The posttest battery for the child consisted of the Battelle Developmental Inventory and the Minnesota Child Development Inventory, which was completed by the mothers. Information regarding the child's IEP (Individualized Educational Plan) objectives was also obtained. Posttest measures for the parent consisted of the Parent Stress Index; the Family Support Scale (FSS) (Dunst, Jenkins, & Trivette, 1984) (assesses the availability and helpfulness of different sources of support to families); the Family Resource Scale (FRS) (Leet & Dunst, 1985) (measures the extent to which different types of resources are adequate in households with young children); a test of parent knowledge concerning the use of behavioral principles taught in the PIE instruction; the Family Environment Scale (FES) (Moos, 1974) (assesses general family functioning in ten areas: cohesion, expressiveness, conflict, independence, achievement orientation, intellectual-cultural orientation, active recreational orientation, moral-religious emphasis, organization, and control); the Child Improvement Questionnaire (DeVillis, Revicki, & Bristol, 1984) (assesses parental beliefs about the factors contributing to the improvement of their child with a handicap); the Family Index of Life Events and Changes (FILE) (McCubbin, Patterson, & Wilson, 1983) (assesses life events and changes experienced by a family unit); the Impact on Family Scale (measures stress and coping); the Home Screening Questionnaire (Coons, et al., 1981) (a screening instrument designed to describe types of stimulation in the child's home environment that foster cognitive development); and, the Family Adaptability and Cohesion Scales (FACES) (Olson et al., 1985) (assesses perceived and ideal levels of family functioning).

Posttest #2. A second posttest was conducted on both treatment groups in August, 1987. (During the time between the first and second posttests, parents were not monitored for their use of the principles they learned in the parent instruction groups.) Parents were contacted via telephone and appointments were made for both parents and their child(ren) to complete the core measures. The children were administered the BDI while parents filled out the parent survey form, the Family Resource Scale, the Family Support Scale, the Parent Stress Index, the Family Adaptation and Cohesion Scale, the Family Inventory of Life Events, and measures of child health and parent satisfaction with services. After the completion of both the BDI and family measures, parents were compensated $30 for their time.

The teacher measures used at Posttest #2 were not sent out until Spring, 1988. Permission was obtained from the parents to contact their children's public school teachers, and the questionnaires were mailed to the teachers. These teachers were asked to complete a questionnaire developed to ascertain teachers' impressions of parent's knowledge of their child's program and progress in comparison with other parents. This questionnaire also gathered information on the child's classification, school attendance, classroom placement, tests administered, teacher certificates held, and teacher's recommendation for the child's future placement.

As an incentive for teachers to participate, posters appropriate for classroom use were mailed with the questionnaire. This questionnaire had a 100% return rate. (Several children remained in private preschool or home care settings, so data was only reported for children who had moved into the public schools.)

Posttest #3. The third posttest occurred during the summer of 1989. Procedures for this posttest were similar to that of the second posttest. Parents were contacted via telephone and appointments made for parents and their children to complete the core measures. Assessments were conducted at a local community college and a nearby preschool. The children were administered the BDI while parents completed the Parenting Stress Index, Family Support Scale, Family Resource Scale, Family Adaptability and Cohesion Scales, a demographic survey, and a measure of child health. Testing sessions lasted approximately two hours and parents were paid $35 for their participation.

Posttest #4. The procedures for the testing and most of the measures remained the same for posttest #4. A major portion of the families were tested in April and May, 1990, with a few being tested in June and July. Most of the testing took place at a special education center in the Salt Lake valley with some (primarily those living out of state) being tested in their homes.

The children's development was assessed this time with the Woodcock-Johnson Achievement Test-Revised (WJ-R) (Woodcock & Johnson, 1989). The Battelle Developmental Inventory (BDI) was no longer appropriate because part of the children were now functioning beyond the upper limits of the test. The WJ-R was chosen after extensive research. The standard battery of the WJ-R consists of nine specific tests, six of which make up an early development total. From these six scales, a broad knowledge total score and a skills total score are computed, with the broad knowledge score including science, social science and humanities scores, and the skills total including letter-word identification, applied problems and dictation scores. The WJ-R is appropriate for ages from two to adulthood. The test was not the best measure of three of the children in the sample (two from the Center-Based Only group and one from Center-Based + PIE group) because their developmental age, as measured by the BDI at Posttest #3, was less than 24 months. These three children did not establish basal scores on the WJ-R at Posttest #4. Therefore, their raw scores for the broad knowledge total and skills total were entered as zeros and their age equivalent scores were entered as 24 months. Two of these children were in the Center-Based group and one in the Center-Based plus PIE group.

The Woodcock-Johnson Scales of Independent Behavior (SIB) (Bruininks, Woodcock, Weatherman & Hill, 1985) was used as a complementary measure to measure development other than cognitive development. The subscales of the SIB, which are completed by the child's mother or father, include a motor cluster, a social and communication cluster, a personal living skills cluster which approximate the personal-social, motor, communication, cognitive, and adaptive behavior subscales of the BDI. In addition, the SIB has a community living skills cluster.

Mothers (or fathers) completed the same core family measures that were used at Posttest #3. In addition, they completed a demographic survey, a child health survey, a survey of their children's current educational program, and the test of parent knowledge concerning the P.I.E. curriculum. (This was the same test they took at Posttest #1.) Videotaping of parent-child interaction was also completed, using the standardized protocol. The testing session lasted approximately 2½ hours and parents were paid $50 for their participation.

Also, with the parents' permission, the current school teachers were contacted and were asked to complete a measure of the child's development and a questionnaire describing the children's present educational program and evaluating the parents' participation in the children's education. The measure chosen to evaluate the children's development was the Developmental SPECS, a System to Plan Early Childhood Services (Bagnato & Neisworth, 1989). The measure includes 19 items (i.e. receptive language, hearing, health, etc.), each of which was rated by the teacher on a five point Likert-type scale. A score of 5 indicates normal development for that item as compared to children of the same age and a score of 1 indicates the most maladaptive score. From the 19 items, the scores are computed for six types of development, which include communication, sensorimotor, physical, self-regulation, cognition, and self/social. The teachers were sent posters with the questionnaires to thank them for their participation. All but two of the teachers returned the questionnaires, providing data for 43 of the children.

Results and Discussion

The purpose of this research project was to determine if the addition of this particular type of parent involvement program to an already existing center-based early intervention program would significantly add to the child's development or affect family function. In addressing these questions, the results will be discussed by first comparing the pretest scores of the children and parents in the parent involvement group with those of the children and parents in the center-based only group. Next, the posttest scores measured at the end of that first year of intervention (Year #1), and Years #2, #3, and #4 will be compared.

Specifically stated, the questions which these analyses seek to answer are:

1. What are the immediate and long-term effects of adding this type of parent involvement program to an existing center-based early intervention program on the young child with a handicap and on the family system?
2. What is the relationship between the effects of these alternative types of programs and child characteristics, and family characteristics?
3. Is the magnitude of the effect associated with the degree of parental participation, and how does time affect this relationship?

Comparability of Groups at Pretest

Table 17.9 presents results of the comparability of groups on pretest measures. No statistically significant differences were found between the groups at time of pretest on either of the primary measures of child development, the Battelle Developmental Inventory or the Minnesota Child Development Inventory, or on any of

Table 17.9

Pretest Comparisons on Child and Family Measures of the Subjects in the Center-based only and Parent Involvement Groups for the 1985 Parent Involvement Study

	Center-based only				Center-based + PIE					
	$\bar{x}$	(SD)	%ile	n	$\bar{x}$	(SD)	%ile	n	p Value	ES^
CHILD MEASURES										
• **Battelle Developmental Inventory (BDI)***										
DQs for:										
Personal Social	61.0	23.6		25	56.8	14.1		26	.45	-.17
Adaptive Behavior	55.6	16.4		25	54.6	16.8		26	.82	-.06
Motor	52.8	20.4		25	55.9	21.3		26	.59	.15
Communication	53.3	19.9		25	50.3	15.0		26	.54	-.15
Cognitive	57.4	20.9		25	54.4	16.0		26	.57	-.14
TOTAL	56.0	17.0		25	54.6	12.4		26	.74	-.08
• MCDI (age equivalent)										
General Development	25.3	8.3		24	26.5	8.8		26	.62	.14
Gross Motor	22.3	12.4		24	25.4	13.2		26	.40	.25
Fine Motor	32.2	11.2		24	32.1	10.9		26	1.00	-.01
Expressive Language	27.3	12.2		24	25.5	7.8		26	.54	-.15
Comprehension Conceptual	29.2	13.5		24	27.0	7.2		26	.46	-.16
Situation Comprehension	31.1	12.6		24	33.0	16.6		26	.66	.15
Self-Help	27.9	9.5		24	29.8	10.2		26	.50	.20
Personal-Social	26.8	11.9		24	28.4	12.0		26	.64	.13
• Stanford Binet IQ&$	72.0	18.9		13	65.5	18.5		15	.37	-.34
• Bayley Infant Developmental&	128.0	30.5		12	134.3	13.6		12	.52	.21
• SICD (age equivalent) Receptive	26.5	9.5		24	27.4	8.6		26	.73	.09
• SICD (age equivalent) Expressive	23.5	10.6		24	22.6	11.0		26	.77	-.08
FAMILY MEASURES										
• **Parenting Stress Index (PSI) Percentile Rank@**										
Child Related (range 47 to 235)	122.7	19.3	90	24	125.2	26.8	92	26	.71	-.13
Other Related (range 54 to 270)	134.2	27.0	72	24	136.9	29.9	75	26	.74	-.10
TOTAL (range 101 to 505)	256.5	41.4	84	24	263.8	53.5	88	26	.59	-.18

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[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[@] On the PSI, lower scores represent less stress and are, therefore, better. To assist with interpretation, a percentile score is also reported in the table based on the authors' norming sample.

[&] Child were tested with the Stanford-Binet or Bayley Pretest depending on their age and developmental level. One child in the Center-Based + PIE group was measured with both.

[$] Scores for the Bayley are raw scores. Age equivalent $\bar{x}$ = 20.1 months for Center-Based Only group and 20.8 months for Center-Based + PIE group. The mean chronological ages for the two groups were 42.17 and 39.00, respectively.

[^] $$ES = \frac{\text{Center-based only + PIE } \bar{x} - \text{Center-based only } \bar{x}}{\text{Center-based only SD}}$$

their subscales. Also, there were no differences on any of the other child development measures (the Sequenced Inventory of Communication Development [SICD; Tobin, 1984], the Stanford-Binet [Form L-M, 1960] or the Bayley Scales of Infant Development). Likewise, no significant differences on the family stress scores as measured by the Parenting Stress Index were found. The other core family measures (FRS, FSS, FACES, and FILE) were not administered at the pretest. Likewise, the demographic characteristics of the groups were very similar, with the only statistically significant differences being the mother's education and the number of siblings (see Table 17.2). The two groups appeared to be very comparable before the parent instruction began.

Selection of Covariates

The majority of analyses presented are based on analysis of covariance procedures completed using SPSS-PC. Treatment group (center-based only or center-based plus parent involvement) was the independent variable and dependent variables were scores on the posttest instruments. Analysis of covariance procedures are useful for two purposes: (a) to increase the statistical power of a study by reducing error variance; and (b) to adjust for any pretreatment differences which are present between the groups. In either application, the degree to which analysis of covariance is useful depends on the correlation between the covariate(s) selected and the outcome variable for which analyses are being done. However, since one degree of freedom is lost for each covariate used, it is generally best to use a limited number of covariates in any given analysis. All pretest and demographic variables were considered as potential covariates. The final selection of covariates depended on a judgment of which variable or set of variables would maximize the correlation or multiple correlation with the outcome variable in question and still include those demographic or pretest variables for which there are the largest pretreatment differences. In each analysis, the specific covariates used are indicated in the table. When examining results, the critical p value for assuming statistical significance was set at 0.05. Due to the statistical difference between groups at the time of pretest, maternal education was used as a covariate throughout the analyses, but since number of siblings was found to be unrelated to measures of child and family functioning, it was not used as a covariate. Also, the pretest scores of each subscale or scale was used as a covariate in the analysis of that particular scale or subscale.

The covariates (the pretest demographic variables and scores) used at posttest 4 differed somewhat from those previously used. The mothers in the center-based only group continued to have significantly more years of education than did the mothers in the parent involvement group, and there were still significantly more siblings in the center-based only group than in the parent involvement group. However, the correlation analyses found the number of siblings variable to be as related to the outcome measures as the mother education variable. Therefore, both were used as covariates in the analyses of the child and family measures. Pretest scores were used as covariates when available. The total pretest developmental quotient score from the BDI was found to be the best covariate for all the WJ-R and SIB scales.

Measures of Child Functioning

Posttest #1, #2, and #3. Table 17.10 shows comparisons on measures of child functioning at Posttests #1, #2, and #3. For these posttests, the Battelle Developmental Inventory was the primary measure of child development. Out of 18 BDI scores, only one statistically significant difference was found at Posttest #1, and that was for the BDI personal/social domain. (If this advantage for the parent instruction group represents an actual advantage, a similar difference would be likely at Posttests #2 and #3, but it was not found.) No differences were found on

Table 17.10

Posttest Comparisons on Child Measures of Subjects in Center-based only and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj.$\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
Posttest #1												
● Age in months at pretest	---		(8.3)	52.6	24		(9.6)	52.6	25	.00	.99	.00
● **Battelle Developmental Inventory (BDI) DQs for:**[*,$]												
Personal-Social	0, 1	67.0	(23.1)	63.7	24	71.6	(21.8)	74.9	25	7.38	.01	.48
Adaptive Behavior	0, 1	61.9	(20.6)	61.1	24	63.2	(16.6)	64.1	25	.67	.42	.15
Motor	0, 1	55.2	(16.8)	56.6	24	58.8	(19.2)	57.4	25	.06	.81	.05
Communication	0, 1	55.7	(22.4)	54.0	24	54.6	(15.9)	56.3	25	.69	.41	.10
Cognitive	0, 1	60.3	(20.1)	58.0	24	58.8	(18.9)	61.1	25	.56	.46	.15
Total	0, 1	59.7	(17.9)	58.4	24	61.2	(14.9)	62.5	25	2.40	.13	.23
● **MCDI (raw)**												
General Development	0, 1	80.4	(21.9)	81.2	21	82.5	(23.0)	81.7	25	.07	.80	.02
Gross Motor	0, 1	21.6	(5.6)	22.2	21	24.1	(5.4)	23.4	25	2.93	.10	.21
Fine Motor	0, 1	31.2	(4.8)	31.4	21	32.2	(4.8)	32.0	25	.65	.43	.13
Expressive Language	0, 1	38.0	(12.2)	37.9	21	39.0	(9.9)	39.2	25	1.14	.29	.11
Comprehension Conceptual	0, 1	32.8	(15.1)	32.2	21	31.7	(12.8)	32.4	25	.02	.89	.01
Situation Comprehension	0, 1	28.2	(6.0)	28.2	21	29.4	(6.3)	29.4	25	.94	.34	.20
Self-help	0, 1	22.0	(5.7)	22.7	21	23.4	(5.9)	22.8	25	.01	.91	.02
Personal-Social	0, 1	23.9	(6.0)	24.4	21	24.6	(5.3)	24.1	25	.10	.76	-.05
Posttest #2												
● Age in months at posttest	---		(8.6)	66.7	19		(9.4)	69.3	23	.81	.37	.30
● **Battelle Developmental Inventory (BDI) DQs for:**[*,$]												
Personal-Social	0, 1	57.3	(24.4)	54.8	19	55.7	(17.7)	58.2	23	.55	.46	.14
Adaptive Behavior	0, 1	58.4	(24.9)	58.3	19	54.4	(18.7)	54.5	23	.51	.48	-.15
Motor	0, 1	53.3	(28.8)	54.7	19	53.2	(19.9)	51.8	23	.31	.58	-.10
Communication	0, 1	49.3	(21.3)	47.6	19	46.8	(19.3)	48.5	23	.07	.79	.04
Cognitive	0, 1	55.2	(20.7)	53.4	19	54.5	(18.4)	56.3	23	.41	.52	.14
Total	0, 1	53.5	(19.8)	52.6	19	52.5	(16.5)	53.3	23	.05	.82	.04
● **Child's General Health**	--		(.6)	1.9	19		(.5)	1.9	24	.03	.86	.00
Posttest #3												
● Age in months at posttest	---		(8.6)	90.0	22		(9.2)	90.2	23	.09	.10	.02
● **Battelle Developmental Inventory (BDI) DQs for:**[*,$]												
Personal-Social	0, 1	60.5	(22.8)	56.7	22	56.6	(20.3)	60.4	23	.46	.50	.16
Adaptive Behavior	0, 1	57.4	(21.9)	56.0	22	57.1	(20.3)	58.4	23	.19	.67	.11
Motor	0, 1	50.4	(15.9)	51.6	22	52.0	(20.2)	50.8	23	.05	.82	-.05
Communication	0, 1	50.3	(22.1)	48.3	22	45.7	(18.6)	47.7	23	.03	.87	-.03
Cognitive	0, 1	55.1	(18.1)	52.6	22	52.3	(17.1)	54.8	23	.38	.54	.12
Total	0, 1	53.7	(16.8)	51.9	22	51.7	(16.5)	53.5	23	.26	.62	.10

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[*] For ease of interpretation, Battelle scores have been converted from the raw scores to a ratio Development Quotient (DQ) by dividing the "age equivalent" (AE) score reported in the technical manual for each child's raw score by the child's chronological age at time of testing.

[$] Covariates: 0 = This same scale taken at pretest; 1 = Highest completed year of education - Mother

[#] ANCOVA F, p values, and ESs are computed using adjusted means.

$$\hat{ES} = \frac{\text{Center-based only + PIE adj } \bar{x} - \text{Center-based only adj } \bar{x}}{\text{Center-based only SD}}$$

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Table 17.11

Comparison of Posttest Measures of Child Functioning for Subjects in Center-based only and Parent Involvement Groups at Posttest #4 in the 1985 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable[*]	Covariates[&]	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	n	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	n	ANCOVA F	p Value	ES[^]
● Child Age at Posttest #4			(8.4)	100.7	23		(8.6)	99.7	23		.69	-.12
● **Woodcock-Johnson Achievement Revised (WJ-R)**												
Broad Knowledge Total Score	1,2,3,4	63.2	(25.6)	62.5	23	62.5	(21.1)	63.3	22	.41	.53	.03
Skills Raw Score	1,2,4	63.1	(21.9)	61.3	23	62.0	(21.0)	63.9	23	.68	.42	.12
● **Woodcock-Johnson Scales of Independent Behavior (SIB)**												
Motor Skills Cluster Raw Score	1,2,4	51.7	(23.8)	51.1	22	56.6	(23.1)	57.2	23	.87	.36	.26
Social/Comm. Cluster Raw Score	1,2,4	69.4	(32.7)	67.2	22	57.9	(28.0)	60.1	23	.21	.65	-.22
Personal Living Cluster Raw Score	1,2,4	61.4	(27.5)	60.9	22	61.4	(24.1)	61.9	23	.31	.58	.04
Community Living Cluster Raw Score	1,2,4	67.1	(27.4)	65.6	22	63.4	(25.4)	64.8	23	.00	.95	-.03
Broad Independence Raw Total Score	1,2,4	63.6	(25.5)	61.3	21	61.4	(23.4)	63.7	23	.08	.78	.09
● **Developmental System to Plan Early Childhood Services (SPECS)**												
Communication Total	4	6.5	(1.5)	6.4	23	6.5	(1.2)	6.6	21	.16	.69	.10
Sensory Motor Total	4	14.6	(2.5)	14.5	23	14.8	(2.4)	14.8	21	.18	.67	.13
Physical Total	4	11.4	(2.4)	11.4	23	12.0	(2.0)	12.1	21	1.4	.24	.31
Self-regulation Total	4	14.2	(3.3)	14.1	23	13.9	(3.4)	14.0	21	.01	.91	-.03
Cognition Total	4	5.4	(2.1)	5.3	23	5.3	(2.0)	5.4	20	.07	.79	.06
Self-Social Total	4	12.7	(4.1)	12.5	23	12.7	(3.5)	13.0	20	.28	.60	.12
● **Child's General Health**[@]	--		(.5)	2.0	23		(.6)	2.1	22	.36	.55	.21

[#] ANCOVA F, p values, and ESs are computed using adjusted means.

[@] Results computed with t-tests. Means are not adjusted

[&] Covariates: 1 = Highest level of education completed my mother, 2 = Number of siblings, 3 = child's age at pretest, 4 = BDI total pretest.

[*] Statistical analyses for the WJ-R and SIB were conducted using raw scores for each scale. For ease of interpretation, the information in the table has been converted from the raw scores to the age equivalent scores.

[^] $$ES = \frac{\text{Center-based only + PIE adj } \bar{x} - \text{Center-based only adj } \bar{x}}{\text{Center-based only SD}}$$

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the total score or subscale scores of the Minnesota Child Development Inventory at Posttest #1. One significant finding out of approximately 25 could easily be a chance occurrence. Therefore, we conclude that the children in the two groups had made comparable developmental progress.

Posttest #4. The measures of child development at Posttest #4 included the Woodcock-Johnson Achievement Test-Revised (WJ-R), the Woodcock-Johnson Scale of Independent Behaviors (SIB), and the teacher's measure, the Developmental SPECS. Table 17.11 provides the child age equivalent scores as measured by these three measures. The age-equivalent scores for the total sample of children in the WJ-R and SIB range from a low of 54 months for motor development to a high of 65 months for the community living skills with a mean of all six scales (listed on Table 17.11) of 62 months, or approximately 5 years. Considering that the child age at posttest #4 averaged 100 months, or almost 8½ years of age, these children, as a group, would continue to be classified as moderately handicapped (Grossman, 1983). The teachers also see the children's development as delayed or problematic, as measured by the teacher's SPECS. For the SPECS measure, if the children's development is typical or better than the other children of the same age, the possible scores for the communication and cognition scales would each be 10, for the physical scale the score would be 15, and for the sensory motor, self-regulation and self/social scales the scores would each be 20. The average scores range from approximately half to three-fourths of the total possible scores.

In comparing the two groups of children for all three measures of development (WJ-R, SIB, and SPECS), the scores on Table 17.11 indicate no statistically significant differences in development between the children who received only the center-based intervention program and those whose parents participated in the parent involvement component. The analyses of the WJ-R broad knowledge and skills knowledge scores were recomputed leaving out the three subjects who did not establish basal scores. (See previous discussion on the procedures for Posttest #4 testing.) The ANCOVA F and p value scores changed, but remained insignificant; the children in the two groups performed very similarly on these measures.

In sum, over the five year period of this investigation, the children in both intervention groups developed similarly, as measured by direct evaluation, and parent and teacher appraisals.

Measures of Family Functioning

Posttests #1, #2, #3, and #4 core measures. Families in the two groups appeared to be very comparable in their perception of stress, resources, social support, and family functioning when measured by the various scales used. o statistically significant differences were found between the groups at any of the posttests on any of the subscale or total scale scores with the exception of the adaptability score on the FACES scale at Posttest #2 (see Table 17.12). This one statistical difference on a family measure out of 37 scores is probably due to chance.

Although there are no statistically significant differences between the two groups, the findings concerning parental stress provide important information about these families. On the Parenting Stress Index (PSI), the two groups reported similar stress levels for child related stress, parent related stress, and total stress throughout the research (see Table 17.12). The additional parent instruction did not seem to affect the parents' stress scores as measured by the PSI. However, these longitudinal data provide the information that these parents' stress scores, as indicated by the percentile scores on Table 17.12, are elevated when compared to the norming sample. The child related stress scores are particularly high, ranking near the 90th percentile across posttests. These findings support previous conclusions that parents of children with handicaps are more stressed than are parents of children who are not handicapped (Kazak, 1987; Wilton & Renaut, 1986).

Table 17.12

Posttest Comparisons on Family Measures of the Subjects in the Center-based only and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-Based Only					Center-Based + PIE							
Variables	Covariates[$]	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	%ile	n	$\bar{x}$	(SD)	Adj. $\bar{x}$[#]	%ile	n	ANCOVA F	p Value	ES[^]
POSTTEST #1														
● **Parent Stress Index**[*]														
Child Related Range (47 to 235)	0, 1	117.6	(24.3)	119.7	88	23	121.2	(26.1)	119.0	88	25	.04	.84	.03
Other Related Range (54 to 270)	0, 1	132.8	(30.8)	136.5	75	23	136.0	(22.2)	132.3	70	25	.67	.42	.14
Total Range (101 to 505)	0, 1	250.3	(49.9)	257.3	85	23	257.3	(45.5)	250.3	80	25	1.00	.32	.14
● **Family Adaptation and Cohesion Evaluation Scales (FACES)**[']														
Adaptability Range (0 to 24)	1	3.4	(1.9)	3.6		23	3.9	(2.6)	3.7		24	.02	.90	-.05
Cohesion Range (0 to 30)	1	4.0	(2.5)	4.1		23	4.5	(3.0)	4.4		24	.18	.67	-.12
Total Range (0 to 54)	1	5.5	(2.5)	5.7		23	6.4	(3.1)	6.3		24	.40	.53	-.24
Discrepancy	1	11.3	(7.5)	11.4		23	11.9	(9.4)	11.7		24	.01	93	-.04
● **Family Resource Scale (FRS)**[&]	1	118.9	(22.6)	118.7	51	24	119.8	(19.9)	120.0	54	25	.04	.85	.06
● **Family Support Scale (FSS)**[&]	1	32.7	(14.3)	32.5	69	24	31.3	(7.1)	31.5	66	25	.07	.79	-.07
● **Family Index of Life Events (FILE)**[*]	1	11.3	(5.5)	11.9	29	23	11.2	(6.0)	10.6	34	24	.55	.46	.46

(continued)

[$] Covariates: 0 = This same scale taken at pretest; 1 = Highest completed year of education - Mother; 2 = Number of sibs in sample; 3 = Total income

[#] Covariance adjusted means were used in computing ANCOVA F, p value, and ES.

[^]
$$\text{ES} = \frac{\text{Center-based only + PIE adjusted } \bar{x} - \text{Center-based only adjusted } \bar{x}}{\text{Center-based only SD}}$$

[*] Statistical analyses for PSI and FILE were based on raw scores. Low raw scores are most desirable. A negative ES reflects a lower (more positive) score for the center-based + PIE group. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

['] Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best. A negative ES reflects a lower (more positive) score for the Center-Based + PIE group.

[&] Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with children with handicaps).

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Table 17.12 (continued)

Posttest Comparisons on Family Measures of the Subjects in the Center-based only and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-Based Only					Center-Based + PIE							
Variables	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	p Value	ES[^]
POSTTEST #2														
• **Parent Stress Index**[*]														
Child Related Range (47 to 235)	0, 1	118.6	27.1	118.8	87	18	126.0	27.5	125.8	92	23	1.44	.24	-.26
Other Related Range (54 to 270)	0, 1	132.2	23.9	133.5	72	18	140.7	29.1	139.4	77	23	.66	.42	-.25
Total Range (101 to 505)	0, 1	250.8	42.5	253.0	82	18	266.7	51.1	264.4	89	23	.99	.33	-.27
• **Family Adaptation and Cohesion Evaluation Scales (FACES)**[*]														
Adaptability Range (0 to 24)	1	4.7	2.8	4.8		19	2.9	2.4	2.8		23	5.35	.03	.71
Cohesion Range (0 to 30)	1	4.0	3.1	4.0		19	4.6	3.1	4.6		23	.36	.55	-.19
Total Range (0 to 54)	1	6.9	2.8	7.0		19	6.2	2.6	6.1		23	1.06	.31	.32
Discrepancy	1	9.8	8.0	10.1		19	13.6	8.0	13.3		23	1.54	.22	-.40
• **Family Resource Scale**[&] **(FRS)**	1	114.9	26.3	113.2	40	19	117.3	20.6	119.1	51	23	.64	.43	.22
• **Family Support Scale**[&] **(FSS)**	1	32.5	12.1	32.0	67	19	25.9	9.4	26.4	46	23	2.67	.11	-.46
• **Family Index of Life**[*] **Events (FILE)**	1	10.3	6.8	10.6	34	19	11.0	5.1	10.6	34	23	.00	.99	.00
POSTTEST #3														
• **Parent Stress Index**[*]														
Child Related Range (47 to 235)	0, 1	120.1	28.5	120.8	89	21	125.7	23.0	125.1	92	23	.40	.53	-.15
Other Related Range (54 to 270)	0, 1	124.4	35.7	126.5	61	21	137.9	23.3	135.8	74	23	1.10	.30	-.26
Total Range (101 to 505)	0, 1	249.3	51.2	252.4	81	21	255.7	42.2	252.6	81	23	.00	.99	-.00
• **Family Adaptation and**[*] **Cohesion Evaluation Scales (FACES)**														
Adaptability Range (0 to 24)	1	4.4	3.2	4.3		22	4.0	2.4	4.1		23	.10	.75	.06
Cohesion Range (0 to 30)	1	3.5	2.1	3.6		22	4.5	3.2	4.4		23	.86	.36	-.38
Total Range (0 to 54)	1	6.0	3.1	6.1		22	6.7	2.7	6.7		23	.41	.52	-.19
Discrepancy	1	10.4	6.0	11.0		22	13.8	10.5	13.2		23	.70	.41	-.37
• **Family Resource Scale**[&] **(FRS)**	1	122.1	20.9	121.4	55	22	120.3	15.2	121.1	55	23	.00	.96	-.01
• **Family Support Scale**[&] **(FSS)**	1	31.0	13.0	31.4	64	22	31.3	14.5	31.0	63	23	.01	.93	-.03

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Table 17.12 (continued)

Posttest Comparisons on Family Measures of the Subjects in the Center-based only and Parent Involvement Groups for the 1985 Parent Involvement Study

		Center-Based Only					Center-Based + PIE							
Variables	Covariates$^{\$}$	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	%ile	n	ANCOVA F	p Value	ES$^{\wedge}$
POSTTEST #4														
• **Parent Stress Index** $^{*@}$														
Child Related Range (47 to 235)	0, 1, 2	114.9	(22.9)	113.0	79	22	120.8	(24.7)	122.7	90	23	2.40	.13	-.43
Other Related Range (54 to 270)	0, 1, 2	130.1	(23.2)	129.9	66	22	131.4	(21.6)	131.7	69	23	.11	.74	-.08
Total Range (101 to 505)	0, 1, 2	245.0	(38.7)	243.4	74	22	252.3	(40.6)	253.9	82	23	1.07	.31	-.27
• **Family Adaptation and Cohesion Evaluation Scales (FACES)** '														
Adaptability Range (0 to 24)		4.1	(2.7)	4.0		23	3.5	(2.3)	3.6		23	.18	.67	.13
Cohesion Range (0 to 30)		3.4	(2.7)	3.4		23	4.2	(2.6)	4.3		23	1.17	.29	-.34
Total Range (0 to 54)	1, 2	6.0	(2.5)	5.8		23	6.1	(2.3)	6.3		23	.35	.56	-.18
Discrepancy	1	10.1	(7.5)	9.7			8.0	(5.3)	8.4					
• **Family Resource Scale (FRS)**$^{\&@}$	1, 2, 3	121.4	(24.9)	122.6	58	22	121.8	(15.1)	120.6	55	23	.10	.75	-.08
• **Family Support Scale (FSS)**$^{\&@}$	1, 2	27.8	(14.4)	28.1	51	21	26.2	(8.9)	25.9	45	18	.28	.60	-.16

$^{\$}$ Covariates: 0 = This same scale taken at pretest; 1 = Highest completed year of education - Mother; 2 = Number of sibs in sample; 3 = Total income

$^{@}$ Covariance adjusted means were used in computing ANCOVA F, p value, and ES.

$$^{\wedge}\ ES = \frac{\text{Center-based only + PIE adjusted } \bar{x} - \text{Center-based only adjusted } \bar{x}}{\text{Center-based only SD}}$$

* Statistical analyses for PSI and FILE were based on raw scores. Low raw scores are most desirable. A negative ES reflects a lower (more positive) score for the center-based + PIE group. For ease of interpretation, the table also includes an approximate percentile based on the covariance adjusted score and the norming sample reported in the technical manuals. High percentiles on the PSI represent more stress, while high percentiles on the FILE represent fewer stressful life events.

' Scores for each subscale of the FACES are derived from the "ideal" score reported in the technical manual. Scores reported in the table indicate the distance from "ideal" in raw score units. A score of 0 is best. A negative ES reflects a lower (more positive) score for the Center-Based + PIE group.

$^{\&}$ Analyses for the FSS and FRS are based on raw scores indicating number of supports or resources indicated by the family as being available. Higher scores and positive ESs are considered better. No norming sample is reported for these measures. To assist with interpretation, a percentile score is reported in the table based on all pretests collected as a part of the Longitudinal Studies (currently, 645 families with children with handicaps).

Other family measure comparisons at posttest #1. Several other measures of family or parent functioning were used at Posttest #1 to compare the families in the center-based only group with the families in the Center-Based + PIE group. These measures also reflected the comparability of the two groups. No significant differences were found between the two groups on the Child Improvement Scale, the HOME screening questionnaire, or Family Environment Scale (FES) (see Table 17.13). A

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Table 17.13

Comparison of Child and Family Functioning for Subjects in Center-based only and Parent Instruction Groups at Posttest #1 Using Other Measures

	Center-based only			Center-based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
Child Improvement Questionnaire[*]								
Professional	24.6	5.1	22	24.0	12.9	25	62	-.12
Divine Intervention	12.6	4.7	22	14.1	4.7	25	.30	.32
Parent	28.4	4.8	22	28.6	3.5	25	88	.04
Child	23.4	5.3	22	23.3	5.2	25	.91	-.02
Chance	9.7	4.5	22	11.1	4.2	25	.28	.31
HOME Screening Questionnaire[$]	42.0	6.2	22	38.6	9.1	25	.18	-.54
Family Environment Scale[#]								
Cohesion	53.9	9.7	24	55.3	8.9	25	.61	-.54
Expressiveness	53.4	11.4	24	51.6	12.8	25	.63	-.16
Conflict	48.2	9.4	24	45.6	9.3	25	.39	-.28
Independence	40.9	15.1	24	49.0	13.2	25	.07	.54
Achievement Orientation	49.0	9.7	24	51.5	6.9	25	.36	.26
Cultural Orientation	47.3	12.1	24	47.7	10.1	25	.91	.03
Active Recreation Orientation	46.9	13.7	24	38.3	11.6	25	.04	-.63
Moral-Religious Emphasis	60.3	10.6	24	61.2	9.9	25	77	.08
Organization	54.4	10.5	24	54.7	7.5	25	.92	.03
Control	47.4	14.0	24	57.2	8.3	25	.005	.07

$$ES = \frac{\text{Center-based only + PIE } \bar{x} - \text{Center-based only } \bar{x}}{\text{Center-based only SD}}$$

[*] Assesses parental perceptions of factors that affect progress of their developmentally impaired child.

[$] Measures home environment in terms of stimulation of child's development.

[#] Assesses general family function in various areas.

significant difference in favor of the center-based only group was found for the subscales of control and active recreation orientation of the FES scale. With only two significant findings, it is likely that these also are chance fluctuations.

Analysis of variance techniques were used to test effects of treatment condition on posttest data regarding the number and percentage of IEP objectives achieved by children. No statistically significant effects of treatment condition on posttest IEP data were found. These measures were not repeated at Posttest #2, #3, or #4.

Other Analyses

Parent satisfaction measures at Posttest #1 and #2. Different forms of a parent satisfaction questionnaire were filled out by parents at both Posttest #1 and #2.

Parents of both groups were satisfied with the services provided for their children at the centers (see Table 17.14). The questionnaire used a scale of 1 to 4 with possible responses ranging from poor to excellent. With all means being above 3.0, apparently the parent satisfaction on various items ranged from good to excellent.

Table 17.14

Posttest Comparisons of Parent Satisfaction with Services for the Families in the Center-based only and Parent Instruction Groups

	Center-based only			Center-based + PIE				
	$\bar{x}$	(SD)	n	$\bar{x}$	(SD)	n	p Value	ES^
POSTTEST #1								
Parent satisfaction with staff	3.3	.8	24	3.4	.8	25	.76	.13
Parent satisfaction with communication with staff	3.2	.7	24	3.3	.8	25	.60	.14
Parent satisfaction with program goal/activity	3.3	.9	24	3.2	6	25	.66	-.11
Parent satisfaction with program in general	3.2	.8	24	3.4	.7	25	.29	.25
POSTTEST #2								
Parent satisfaction with staff	3.8	.5	19	3.7	.5	24	.37	-.20
Parent satisfaction with communication with staff	3.6	.6	19	3.4	.7	24	19	-.33
Parent satisfaction with program goal/activity	3.6	.6	19	3.4	.6	24	.27	-.33
Parent satisfaction with participation	3.4	.8	19	3.1	.8	24	.27	-.38
Parent satisfaction with services	3.3	.8	19	3.2	.7	23	.54	-.13
Parent satisfaction with child progress	3.5	.7	19	3.3	.8	24	.42	-.29
Parent satisfaction with program in general	3.5	.6	19	3.2	8	23	.26	-.50

$$\hat{}\ ES = \frac{\text{Center-based only + PIE } \bar{x} - \text{Center-based only } \bar{x}}{\text{Center-based only SD}}$$

Parent knowledge measures. At Posttests #1 & #4, the parents in both groups completed a test of parent knowledge, that was based on the P.I.E. curriculum. At Posttest #1 the parents in the parent involvement group did significantly better on the test ($\underline{p}$ = .01), signifying that the parents had learned the information taught in the classes. After four years, at Posttest #4, the parent involvement group still did better (x = 16.57) than the center-based only group (x = 15.39), but the difference was not statistically significant.

Parent/child interaction. At Posttest #4, parent/child interactions were videotaped and rated using the Parental Behavior Rating Scale (Mahoney, 1988). This observational measure was used at this time because preliminary analyses of parent/child interaction for the Utah Parent Involvement 1986 study indicated that the behaviors of the parents who were in the PIE involvement group were somewhat different than those of the parents in the center-based only group. Twelve global parental behavioral styles were each scored on a 5-point Likert-type scale with a score of 5 indicating a greater amount of the behavior (see Table 17.15). Each of the five points are defined in the manual for each behavior. The videotapes were scored by two coders who were trained and supervised by Dr. Mahoney.

Table 17.15

Principal Axis Factor Analysis of Parent Behavior Rating Scale

Parental Behavior	Factor #1	Factor #2	Factor #3
Expressiveness	**.74**	.19	.39
Enjoyment	**.72**	.39	.18
Warmth	**.82**	.22	.15
Sensitivity to Child's Interests	.30	**.80**	-.02
Responsivity	.39	**.79**	-.01
Achievement Orientation	.01	.09	**.72**
Inventiveness	.48	.42	.30
Verbal Praise	.20	.18	.44
Effectiveness	.18	.77	-.00
Acceptance	**.67**	.46	-.04
Pace	.32	-.09	**.54**
Directiveness	.04	-.41	**.76**
Eigen Value	4.74	2.04	.64
% of Variation Accounted for	39.50	17.0	5.30

Factor #1 = **AFFECTIVE RELATIONSHIP WITH CHILD**. Includes Expressiveness toward child, enjoyment of interacting with child, warmth, and acceptance/approval of child and child's behavior.

Factor #2 = **ORIENTATION (RESPONSIVITY) TO CHILD'S INTERESTS/BEHAVIORS**. Includes sensitivity to child's interests, appropriateness of responsiveness, and effectiveness of parent's ability to engage child in play interaction.

Factor #3 = **PERFORMANCE ORIENTATION**. Includes achievement orientation or amount of cognitive stimulation by parent, pace or rate of parent's behavior, and intensity and frequency of parent's directives.

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During the summer and fall of 1990, these coders scored 462 videotapes for the EIRI studies. Using this sample of 462, a factor analysis was completed to reduce the 12 variables to a smaller set. A principle axis procedure (using SPSSPC PA2 procedures) was used with a varimax rotation for extracting the factors. Three factors were identified. Using the behaviors that loaded above .50 in the factor analysis, three cumulative behaviors were computed (see Table 17.15). The first, the affective relationship with the child includes the parental behaviors entitled expressiveness, enjoyment, warmth, and acceptance. The second, orientation to child's interests includes parental sensitivity, responsivity, and effectiveness. The third, performance orientation includes parental achievement orientation, pace, and directiveness. Parental verbal praise and inventiveness in stimulation did not factor out in any of the three factors.

The variables of child age, gender, and developmental level were considered as covariates for the comparison between groups. Gender and developmental status (total BDI score at pretest) emerged as covariates for the variable of parent's performance orientation, but none emerged for the parent's affective relationship with child or orientation to child. No statistically significant differences were found between the parent behaviors in the two groups on any of the three cumulative variables. Parents in the two groups behaved similarly in interaction (see Table 17.16).

Public school follow-up. At posttest #4, public school teachers were sent questionnaires requesting information regarding the children's present educational placement and the parents' participation in their children's education. All but two teachers responded giving us information for 43 subjects. At this time, all of the children were in public school classrooms ranging from kindergarten to fourth grade. The placement pattern among the grades appear to be similar for both groups (see Table 17.17), but this item was only answered by 36 of the 43 teachers. It is possible that grade placement is irrelevant in some self-contained special education

Table 17.16

Comparison of Parental Behaviors in Interaction with CHild for Parents in the Center-Based and Parent Involvement Groups at Posttest #4 in the 1985 Utah Parent Involvement Study

		Center-based only				Center-based + PIE						
Variable	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	ANCOVA F	p Value	ES[^]
Affective Relationship to child[*]	-----	3.2	(.3)	-----	17	3.2	(.6)	-----	20	.23	.64	0
Orientation (Responsivity)[*] to child's interests	-----	3.5	(.7)	-----	17	3.3	(.8)	-----	20	.46	.50	-.29
Performance Orientation[*]	0.1	2.7	(.7)	2.7	17	2.7	(.8)	2.7	20	.04	.84	0

$$\hat{ES} = \frac{\text{Center-based only + PIE } \bar{x} - \text{Center-based only } \bar{x}}{\text{Center-based only SD}}$$

[$] Covariates: 0 = Sex, 1 = BDI total score at pretest.

[*] **Affective relationship to child**: Expressiveness + Enjoyment + Warmth + Acceptance

Orientation (responsivity) to child's interests/behaviors: Sensitivity to child's interests + Responsivity + Effectiveness

Performance orientation: Achievement + Pace + Directiveness.

Maternal inventiveness and verbal praise did not appear in any factor.

Table 17.17

Comparison of Grade Placement of Subjects in the Center-Based Only and Parent Involvement Groups for the 1985 Parent Involvement Study

	Kindergarten	1st	2nd	3rd	4th	Mixed Grade	Total n
Center-based only[*]	1	5	6	2	0	3	17
Center-based + PIE[*]	0	5	7	4	1	2	19

classes. At Posttest #4, 8 children (four from each group) spent 90% or more of their school week in regular classrooms, and 19 (9 from center-based only and 10 from center-based + PIE) spent all of their time in self-contained classrooms. Only two children spent any time in resource rooms and five children spent some time in other types of classrooms. The time for the rest of the children was divided among the four types of classrooms, with the typical arrangement for children in both groups being most of the time spent in self-contained classrooms and approximately one-

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fourth to one-third of the time in regular classrooms. Although at Posttest #4 children whose parents had participated in the parent involvement program spent slightly more time in regular classrooms and less time in self-contained classrooms than did children whose parents had not, the class placement of the two groups is very comparable (see Table 17.17).

In the questionnaire, teachers were also asked a number of questions about the parents' participation in the child's education program. On each item the teachers rated the parents from one to three, representing a range of participation from less than other parents to more than other parents. Two of these items were summed in a parent attendance category, six were summed into a knowledge category, and seven into a support category. The range of possible scores was from 1 to 6, 6 to 18, and 7 to 21, respectively, for parent attendance, knowledge and support of their child's education program. The mean scores (Table 17.18) indicate above average attendance at parent functions, knowledge and support of their child's education for both groups. The parent involvement group had slightly higher scores in knowledge and support categories, but the differences are not statistically significant.

Table 17.18

Results of Teacher Questionnaires for 1985 Parent Involvement Study at Posttest #4

		Center-Based Only				Center-Based + PIE					
	Covariates[$]	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	$\bar{x}$	(SD)	Adj.$\bar{x}$	n	p[*] Value	ES[^][*]
POSTTEST #4											
● Teaching rating of parent's:											
Knowledge	1,2,3	15.1	(4.0)	14.8	18	16.3	(5.3)	16.5	19	.26	.36
Support	1,2,3	16.4	(3.9)	16.0	20	16.7	(3.6)	17.0	18	.39	.27
Attendance	1,2,3	4.8	(1.1)	4.7	19	4.5	(.8)	4.6	19	.61	-.13
● Percent eligible for Special Education services	-----	95.5			22	95.5			20	.95	-.05
● Percent of time in:											
Regular class	-----	24.7	(36.5)	24.7	22	30.1	(37.0)	30.3	21	.62	.15
Self-contained clas	-----	72.8	(36.5)	72.8	22	66.4	(40.4)	66.4	21	.59	-.18

[^] $$ES = \frac{\text{Center-based only + PIE } \bar{x} - \text{Center-based only } \bar{x}}{\text{Center-based only SD}}$$ The sign of the ES only indicates direction of difference, no value judgment is intended.

[$] Covariates: 1 = Family income at Posttest #4, 2 = Mother's education: highest completed year of education, 3 = Father's education: highest year completed.

[*] p values and ES are computed on adjusted means for Knowledge, Support, and Attendance.

Conclusions

The primary purpose of this investigation was to ascertain the immediate and long-term effects on the child with handicaps and the family system of the addition of a particular type of parent involvement program to a center-based early intervention program. The data gathered from the four posttests indicate that the addition of this type of parent involvement component to a center-based intervention for children with handicaps had little effect on either the children's development or the family system. Child development was measured by the Battelle Developmental Inventory (BDI), (at Pretest and Posttests #1 to #3), the Minnesota Child Development Inventory (MCDI) (at Posttest #1), the Woodcock-Johnson Achievement-Revised (WJ-R), the Woodcock-Johnson Scales of Independent Behavior (SIB), and the Developmental SPECS (all at Posttest#4). The child development scores across all four posttests (and as measured by all five measures) indicate that the two groups developed similarly and that the addition of this type of parent involvement component did not give their children an advantage over the children whose parents did not receive the instruction.

Neither was the family system affected, as indicated by the measures of parent stress, family support, family resources, and family functioning. It can be hypothesized that attendance at the parent instruction classes might lessen parent stress and increase the parents' feeling of social support. Again, neither the data gathered immediately following the alternative intervention or later showed that the parents in the parent involvement group felt less stress or perceived more social support. It is important to note that from the pretest through four posttests that the child related stress remained high, with the average stress across posttests being, for both groups combined, at the 88th percentile. There were also no differences between the two groups on their perception of resources, or family functioning.

Finally, the addition of the parent instruction did not seem to affect the child's subsequent school experience, as measured at Posttest #4. The school placement was not significantly different, nor was the teacher's perception of parents' attendance, support, and knowledge.

These findings are important in that this type of parent involvement has been one of the most frequent ways in which early intervention programs have involved parents (see White, et. al. 1989). The findings do not support the claims that this type of parental involvement program increases the effectiveness of the intervention program or enhance the longitudinal benefits of early intervention. However, the results of this study should not necessarily be generalized to other types of parent involvement programs.

It is useful to interpret the results of this study in conjunction with the Des Moines and the Utah 1986 studies which are replications of this study. Together, they provide relevant findings regarding the efficacy of the addition to a center-based early intervention program of a parent involvement component which primarily focused on teaching the parent to assist in delivering developmental therapy to their child. The research design and methodology for these studies have been sound. Jointly, they demonstrate that questions about parent involvement can be addressed with methodologically sound experimental studies and have advanced the search for the types of parental involvement that "work." This information is needed to facilitate the directives of P.L. 99-457.

PART III: TABULAR SUMMARIES OF EACH OF THE LONGITUDINAL STUDIES

The design, implementation, and results of these **Longitudinal Studies** are sufficiently complex that it is difficult to synthesize the key information from each study in a way that facilitates cross study comparisons. To assist in making such comparisons, this section presents the most critical information about the design of each study and summarizes in graphic form the results for child and family outcomes. These tabular and graphic representatives are best interpreted in conjunction with the more complete written reports in Part II and should not be viewed as an adequate substitute for those reports.

Two pages of information are presented for each study. The first contains information about the alternative forms of intervention which were being examined. The second page contains a graphic summary of the outcomes for the various measures of child and family functioning. The graph is interpreted as follows: outcome measures are listed down the left side of the page. Each graph has a vertical line down the center of the remainder of the page. Numbers opposite each outcome measure indicate whether it is the first (represented by "1"), second (represented by "2"), etc. posttest. The location of the number with respect to the vertical line indicates the results for that test. If the number is to the left of the line, the group on the left side of the line did better. The distance from the vertical line represents the size of the effect in standard deviation units. If a number has a square around it, the result was statistically significant at $p \leq .05$. A circle around a number indicates statistical significance at $.05 < p \leq .10$.

To illustrate for the Jordan Intensity Study: two groups (3 days a week vs. 5 day a week) of child functioning (two of which had subscales). The result for the Battelle Developmental Inventory's cognitive subtest was about .28 standard deviation units in favor of the 5 day per week group at the first posttest (statistically significant at p < .10) and .08 standard deviation units (not statistically significant) in favor of the 3 day per week group at Posttest #2. Larger numbers indicate the average effect for either child or family measures for a particular posttest.

Such graphic representations provide an excellent summary of the magnitude, direction, and statistical significance of a large number of measures which are useful in interpreting the overall effect of the intervention.

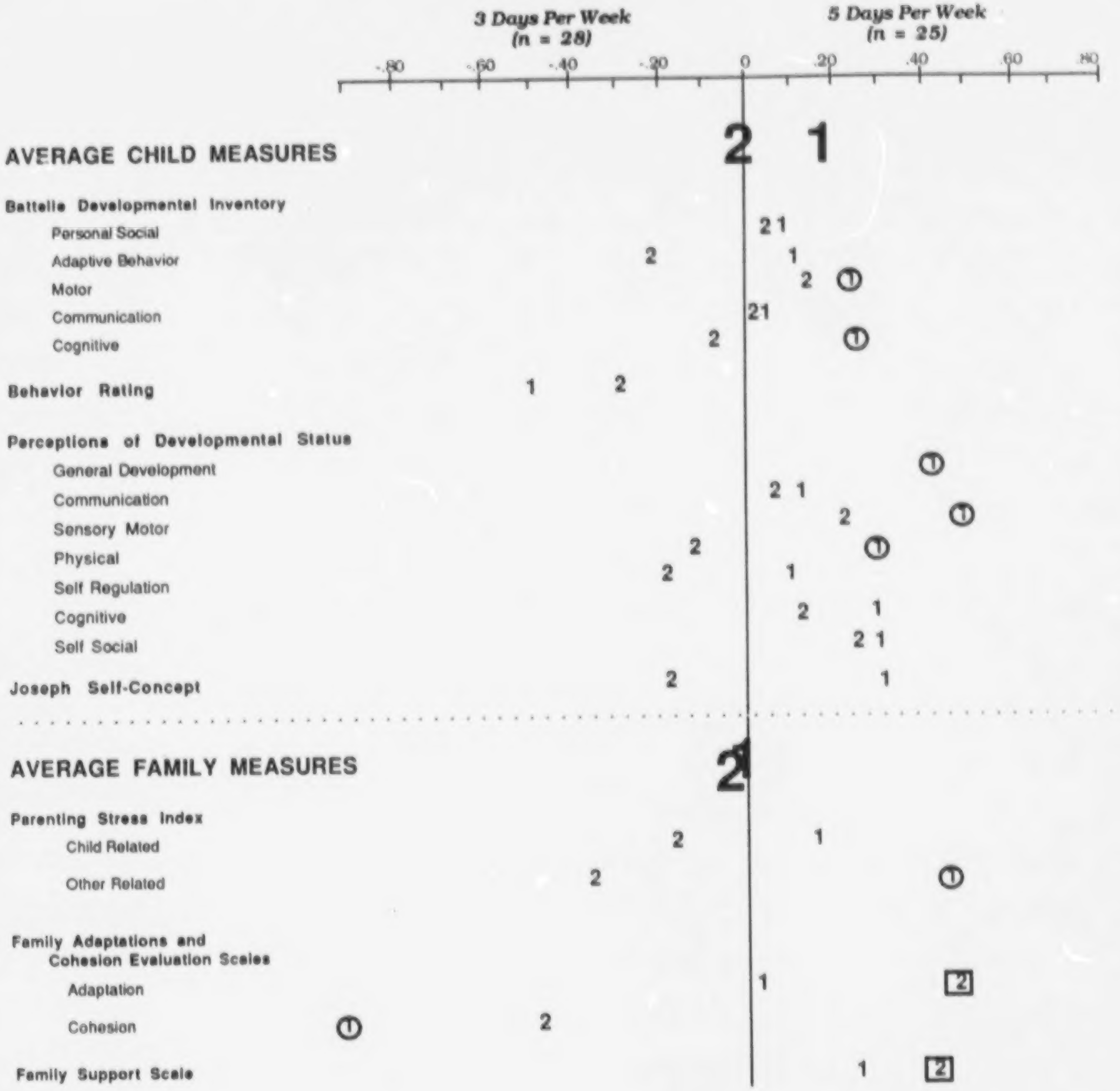
JORDAN INTENSITY STUDY

Design

- *53 mildly to severely handicapped preschool-aged children randomly assigned to 2 intervention groups.*

Less Intensive Intervention Program	**More Intensive Intervention Program**
• 3 days per week: 2 hours per day	• 5 days per week; 2 hours per day
• 1:5 teacher/child ratio	• 1:3 teacher/child ratio
• One teacher assisted by two paraprofessional aides	• One teacher assisted by four paraprofessional aides
• Communication therapist available in classroom every other day	• Communication therapist available in classroom every day
• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities	• Intervention based on IEP using varied curricula through a theme-based, developmentally appropriate approach focused on teaching skills during daily activities

JORDAN INTENSITY STUDY



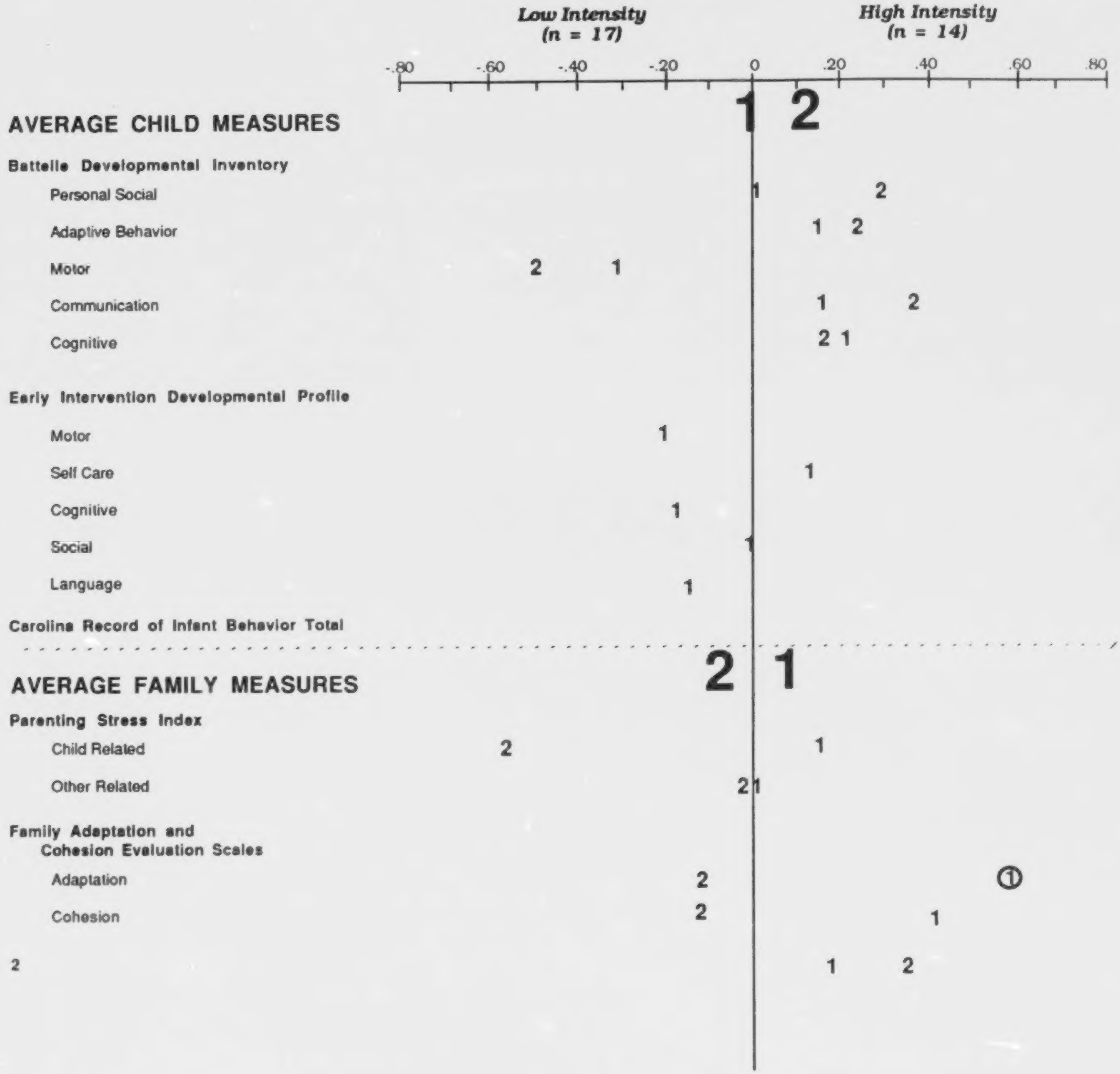
NEW ORLEANS VISUALLY IMPAIRED STUDY

Design

- *30 infants/toddlers with mild-severe visual impairments randomly assigned to 2 interventions*

Low Intensity	High Intensity
● Contact with family average of 1 time per month	● Contact with family 4 times per month
● Contact with parent only	● Contact with parent and child
● General information related to VI given to parents	● Individualized Family Service Program for child and family
● Parents seen in a small group	● Parents seen individually
● Meetings held at the center	● Most visits with parents at their homes
● Variety of guest speakers	● Consistent primary intervenor, i.e., certified special education teacher and social worker
● Group presentations by doctors, educators, therapists re: --child development --effects of visual impairment on development --information regarding etiologies --Reach Out & Teach Handbooks	● Individualized consultation with O.T., P.T., speech/language therapist,
	● Intervention based on: --Louisiana Curriculum --Reach Out & Teach --Naturalistic teaching opportunities --Focus on family and environment

NEW ORLEANS VISUALLY IMPAIRED



SMA/LAKE McHENRY INTENSITY STUDY

Design

- 75 handicapped children randomly assigned to receive early intervention services 3 times per week versus 1 time per week

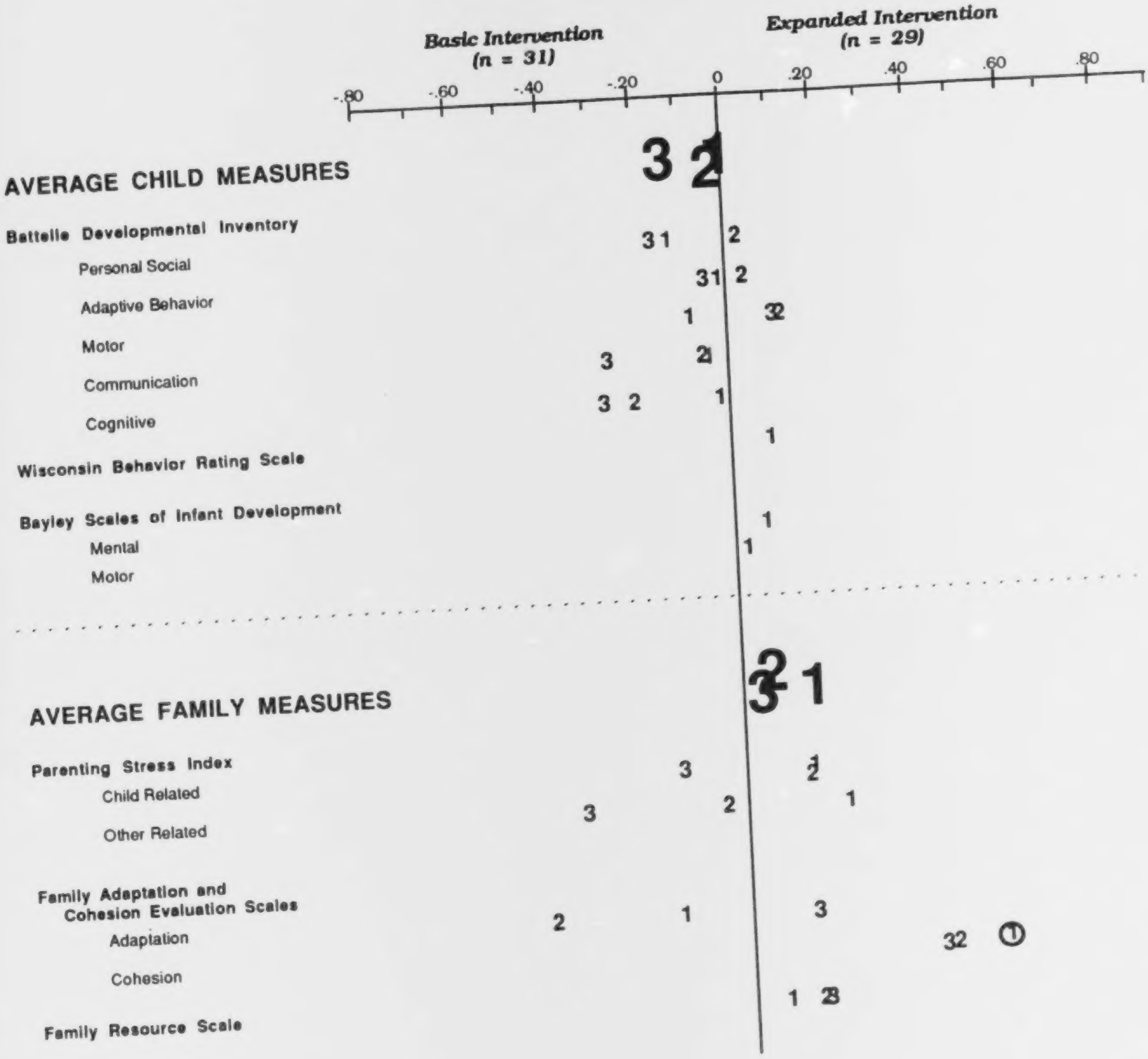
- Services provided primarily at center by parent-infant educator. Some home services provided if transportation is a problem.

- Content of IEP driven by child assessment and family needs, but no specific curriculum used.

- Intervention focused on development in
  - personal/social
  - adaptive behavior
  - motor
  - language
  - cognitive

- Parents were expected to learn intervention techniques and implement them at home as appropriate. Program also provided emotional support to parents and assisted parents to obtain needed assistance outside the program.

SMA INTENSITY STUDY



ARKANSAS INTENSITY STUDY

Design

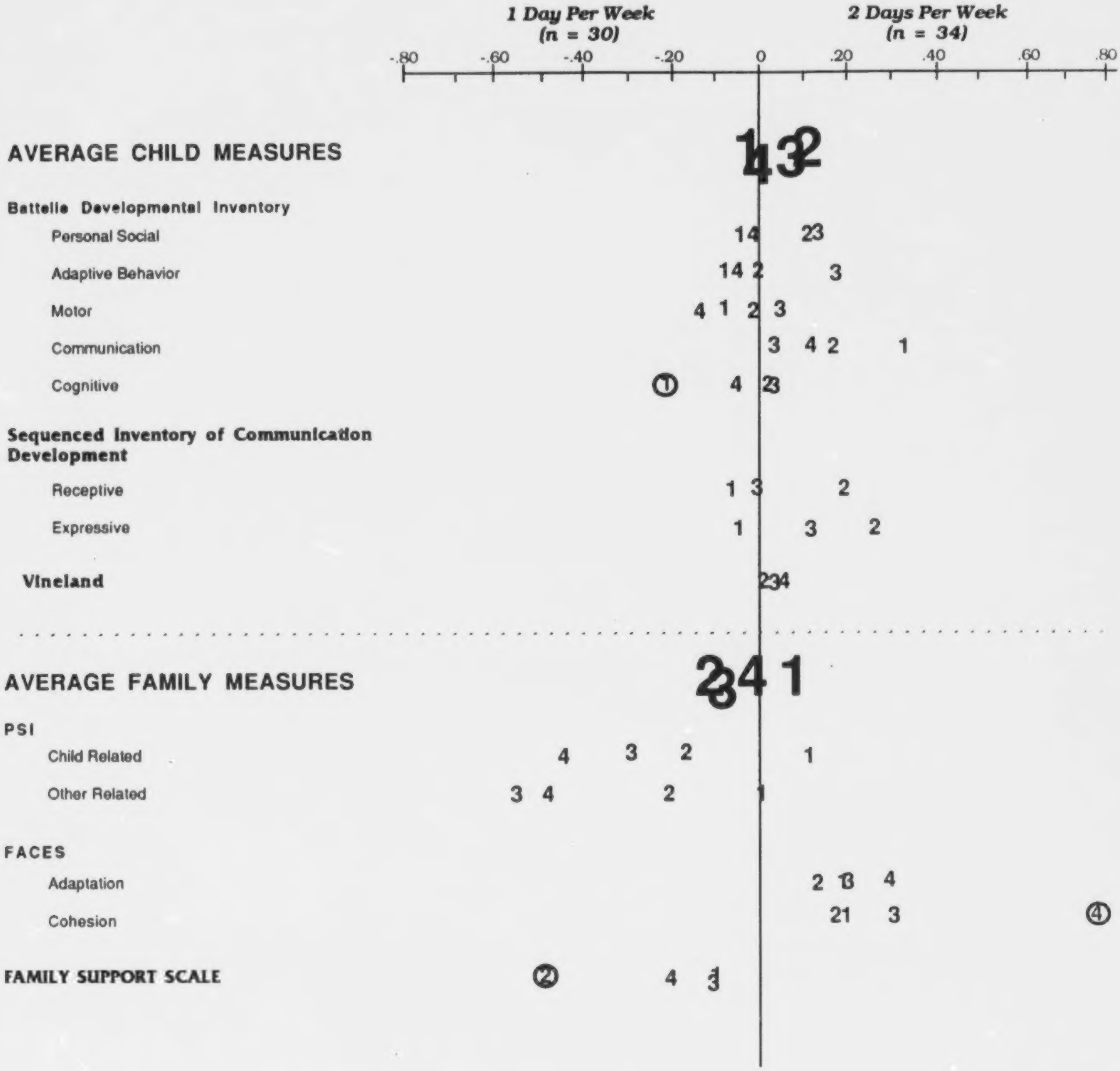
- Seventy-seven 3- to 48-month-old handicapped children randomly assigned to standard (1 time per week) or expanded (2 times per week) home-based interventions.
- Services provided by 9 home visitors, each of whom provided services to some children in each group.
- Intervenors worked directly with the child; parents expected to observe, do follow-up activities, and keep data between visits.
- Intervention focused on development of functional skills in all developmental areas as specified by IEP. Most frequent areas of emphasis:

  Self help (particularly feeding)

  Gross motor

  Communication
- Additional speech or motor therapy provided as needed in a center-based program.

ARKANSAS INTENSITY STUDY



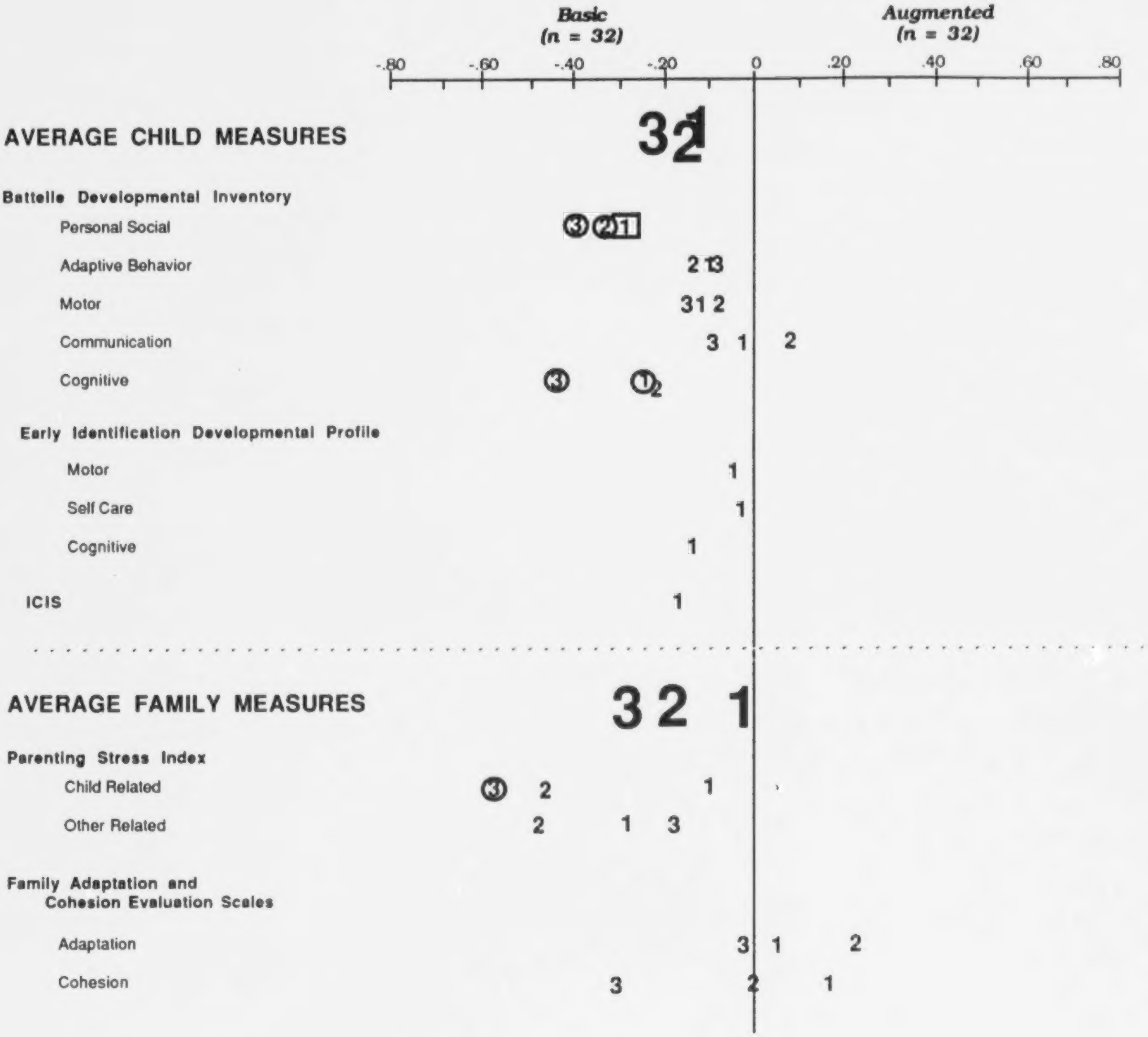
ARC STUDY

Design

- *64 toddler-aged children with mild to severe handicaps randomly assigned to 2 intervention groups*

Basic Program	Augmented Program
5 days per week: 6 hours per day	5 days per week; 6 hours per day
8:2 child/teacher ratio	8:2 child/teacher ratio
Classroom staff consisted of a paraprofessional teacher and aide	Classroom staff consisted of a paraprofessional teacher and aide
Assessment of children by professionals who did not interact with teachers	Transdisciplinary assessment and development of child IEP goals, with teachers playing a major role
Teachers developed child IEPs based on professional's reports and curriculum-based assessment	
Staff training through 1 time per month inservices. No training regarding program implementation	Consultant-based training model where professionals provided in-classroom training and assistance 2-3 times per week. Inservices also attended.
IEP objectives worked on through sporadically implemented 1:1 sessions	IEP objectives worked on through naturalistic teaching strategies, based on Individual Curriculum Sequencing Model, during developmentally appropriate activities

NEW ORLEANS ARC



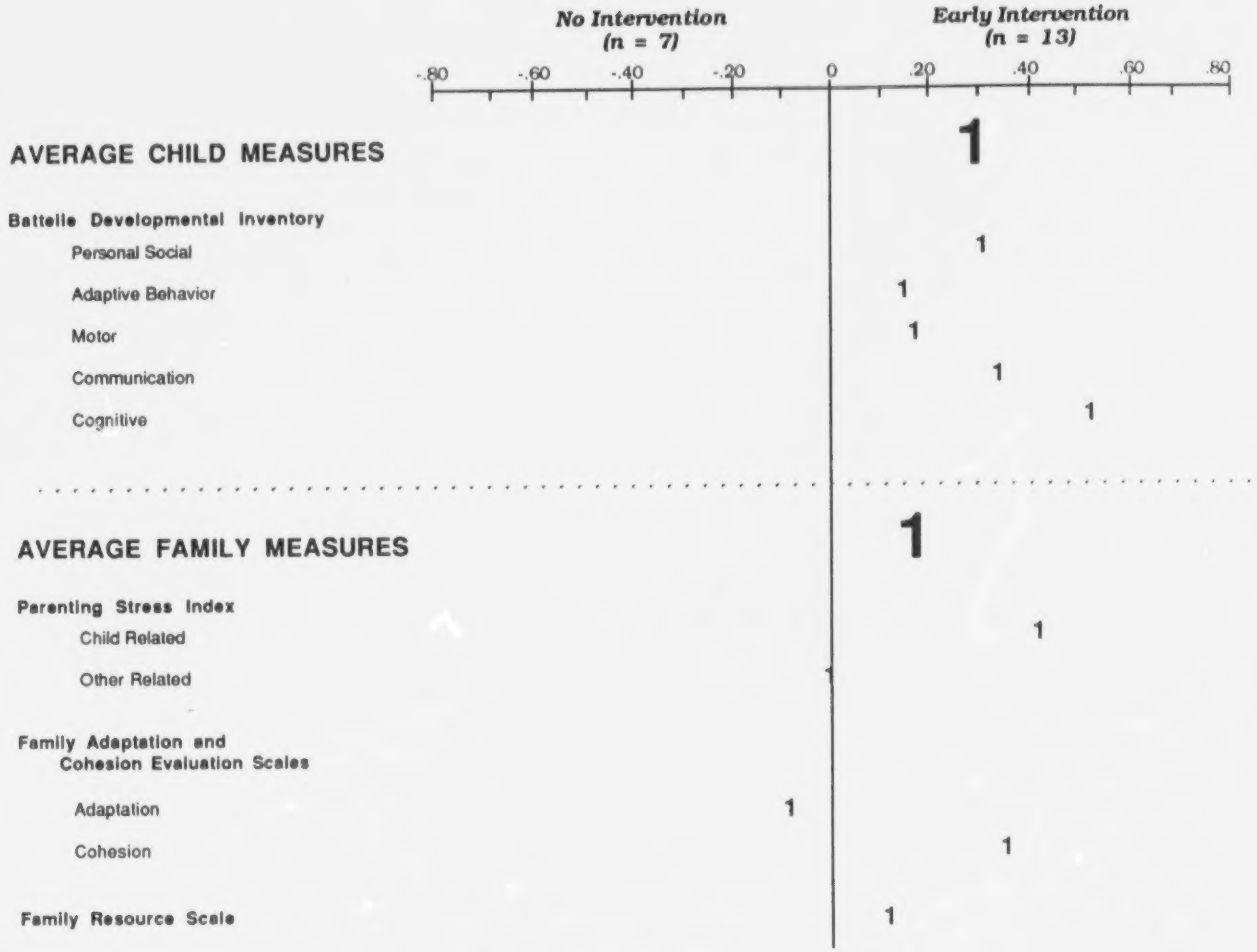
NEW ORLEANS IVH

Design

- *30 infants who were born prematurely and suffered major complications including intraventricular hemorrhage (IVH) and very low birthweight (< 1000 g), recruited in the hospital before discharge and randomly assigned to 2 groups.*

Medical Follow-up	Early Intervention
• Routine medical follow-up program provided by hospital at which children were born. • Follow-up visits scheduled at 3 month intervals • No special incentives of attending follow-up visits. • Referral to specialty clinics for any detected problems. • No organized effort to ensure that parents follow-up on referrals.	• In-hospital, parent-oriented program. Perform Brazelton NBAS and discuss results with parents. "Introduce" parents to baby and discuss special needs of medically fragile infants. • After discharge, the infant was assessed and an IFSP developed in cooperation with family. • Weekly home visits • Objectives were determined from IFSP, but typically include motor, self-help, receptive language, and social-emotional areas. • Intervention provided by a transdisciplinary team including occupational/speech pathologist/Infant Specialists, nurse, paraprofessional home visitor, and social worker. • Home visitors also provided families with help accessing necessary social services.

NEW ORLEANS IVH



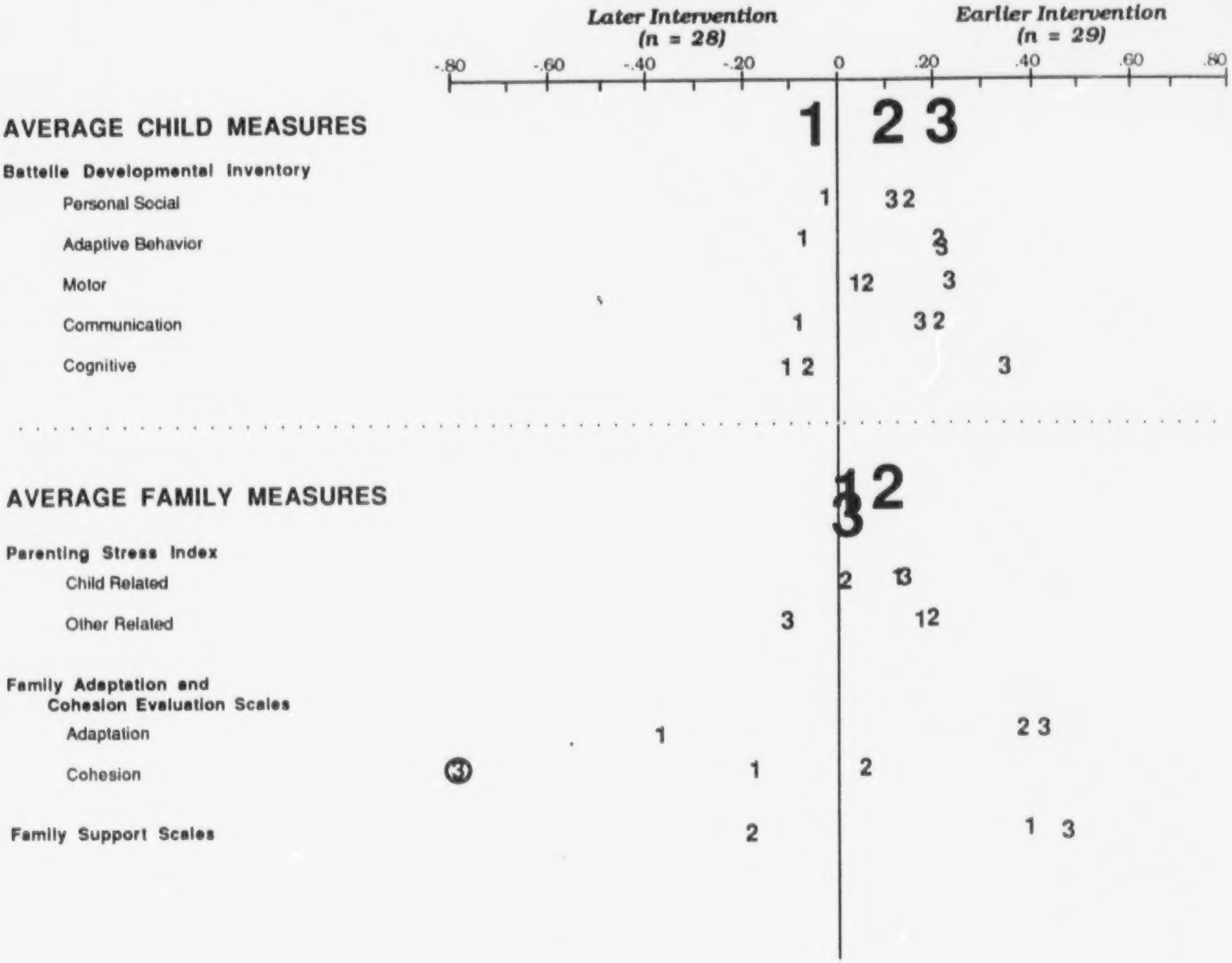
SALT LAKE CITY MEDICALLY FRAGILE STUDY

Design

- *58 intraventricular hemorrhage (IVH) infants randomly assigned to 2 intervention groups.*

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: Utah State Department of Health Neonatal Follow-Up Clinic or private physician	• Medical follow-up: Utah State Department of Health Neonatal Follow-Up Clinic or private physician
	• Sensorimotor intervention --Registered physical or occupational therapist --Curriculum and Monitoring System (CAMS) Motor Program --1:1 child/therapist ratio --Parent training --Monthly to weekly visits --Home- and/or center-based
	• Assistance in locating community services
18 Months Corrected Age	**18 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent training	• Parent training
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

SALT LAKE CITY MEDICALLY FRAGILE STUDY



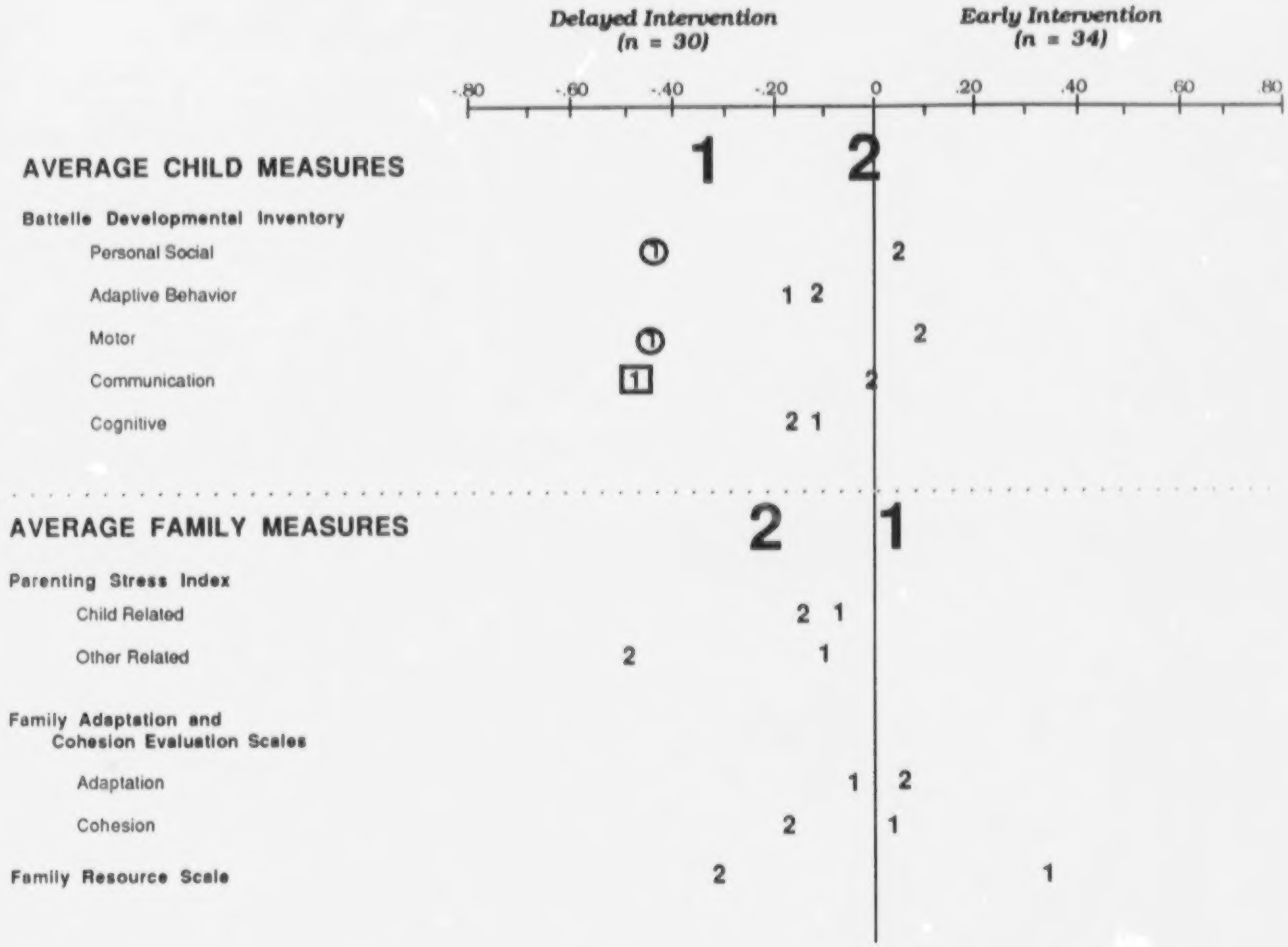
SOUTH CAROLINA MEDICALLY FRAGILE STUDY

Design

- *68 infants who were born prematurely and suffered major complications including intraventricular hemorrhage (IVH) and very low birthweight (< 1000 g), recruited in the hospital before discharge and randomly assigned to 2 groups.*

Delayed Intervention	Early Intervention
3 Months Corrected Age	**3 Months Corrected Age**
• Medical follow-up: South Carolina Department of Health Neonatal Follow-Up Clinic or private physician	• Medical follow-up: South Carolina Department of Health Neonatal Follow-Up Clinic or private physician
	• Sensorimotor intervention --Registered physical or occupational therapist --Curriculum and Monitoring System (CAMS) Motor Program --1:1 child/therapist ratio --Parent training --Twice monthly visits
	• Assistance in locating community services
12 Months Corrected Age	**12 Months Corrected Age**
• Sensorimotor intervention	• Sensorimotor intervention
• Developmental intervention	• Developmental intervention
• Certified teacher	• Certified teacher
• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)	• CAMS curriculum (emphasis on receptive and expressive language, social-emotional, and self-help skills)
• Parent training	• Parent training
• Monthly visits	• Monthly visits
• Home- and/or center-based	• Home- and/or center-based
• Assistance in locating community services	• Assistance in locating community services

SOUTH CAROLINA MEDICALLY FRAGILE STUDY



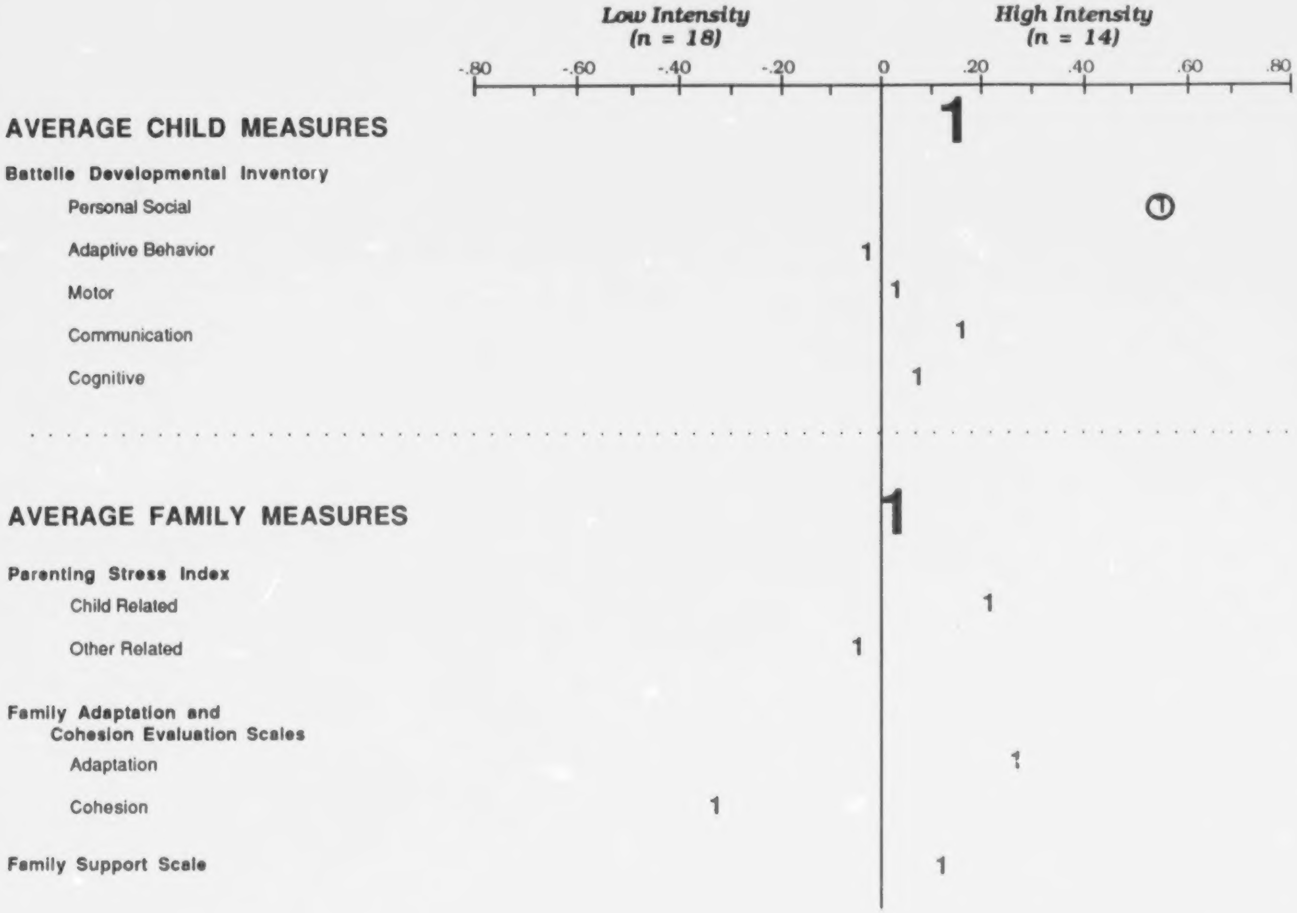
COLUMBUS MEDICALLY FRAGILE STUDY

Design

- *50 infants diagnosed with bronchopulmonary dysplasia (BPD) or neurological damage randomly assigned to 2 intervention groups*

Low Intensity Intervention	High Intensity Intervention
• Medical and developmental follow-up through NICU follow-up clinic	• Medical and developmental follow-up through NICU follow-up clinic
• Referral to community services	• Transition services from NICU to home-based community services --Predischarge hospital visits --Referral to local collaborative group --Collaborative home visits --Additional home visits from local providers
	• Coordinated interdisciplinary early intervention services based on IFSPs --Nursing and medical --OT/PT --Developmental --Social Services --Medical technology personnel
• Referral to local school district or MR/DD programs at age 3	• Referral to local school district or MR/DD programs at age 3

COLUMBUS MEDICALLY FRAGILE STUDY



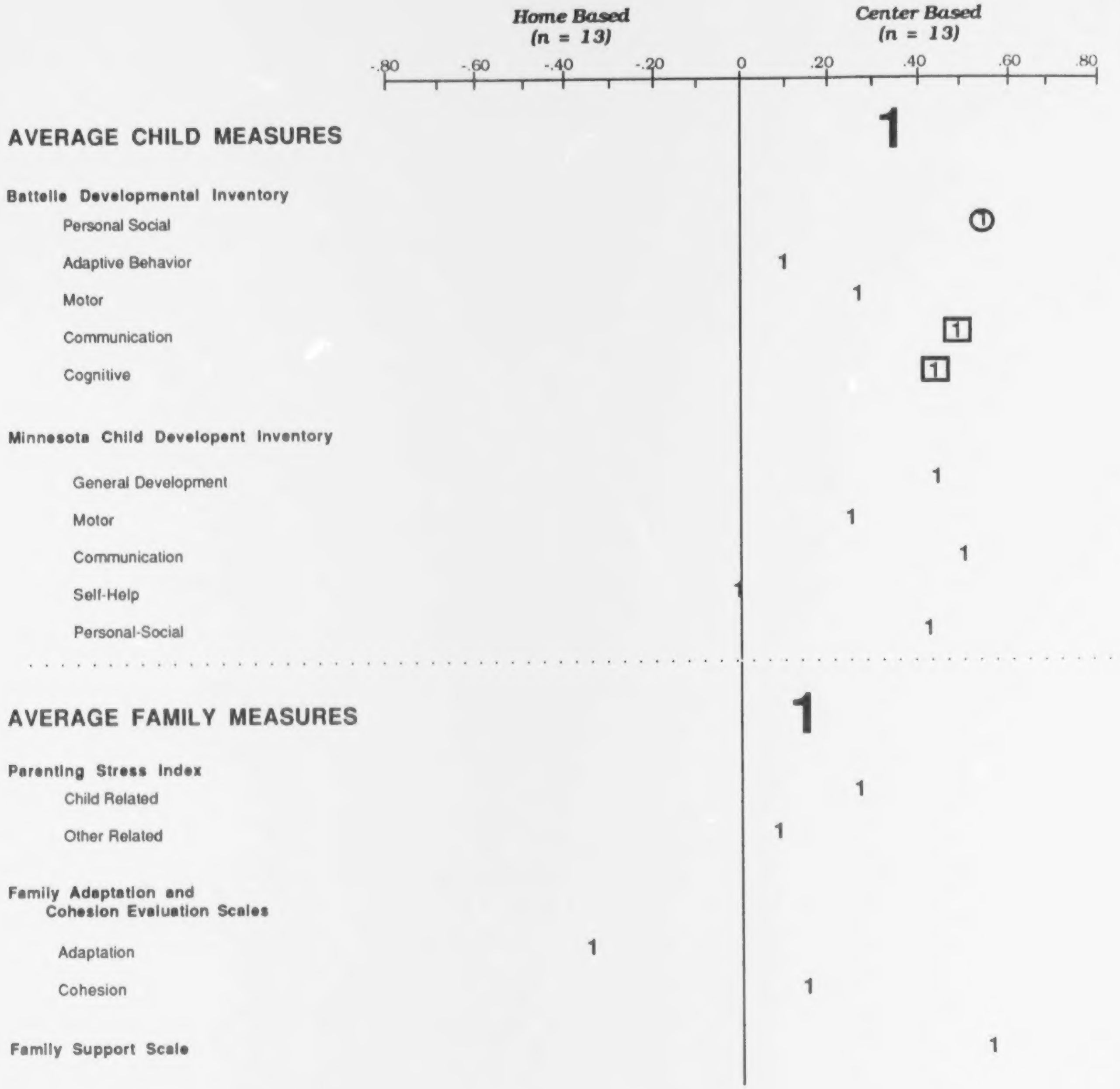
WABASH INTENSITY STUDY

Design

- *26 toddler-aged children with mild to moderate handicaps randomly assigned to 2 intervention groups*

Home-Based Program	Center-Based Program
• Once per week; 1-hour home visit	• 5 days per week; 2-1/2 hours per day
• Home teachers had Bachelor's degrees but were not certified teachers	• 8:2 child/teacher ratio
• Year-round enrollment	• 9-1/2 month period
• Services focused on: educating the parents on the needs of their child, helping them to access services, training the parent in implementation of IEP goals for their children.	• Staff consisted of certified teachers and a paraprofessional aide.
	• Intervention based on IEPs using variety of curricula and emphasized instruction on developmental skills such as motor, language, social, and self-help.
	o Transportation provided

WABASH


Home Based
(n = 13)
Center Based
(n = 13)
-.80
-.60
-.40
-.20
0
.20
.40
.60
.80
AVERAGE CHILD MEASURES
1
Battelle Developmental Inventory
Personal Social
①
Adaptive Behavior
1
Motor
1
Communication
1
Cognitive
1
Minnesota Child Developent Inventory
General Development
1
Motor
1
Communication
1
Self-Help
1
Personal-Social
1
AVERAGE FAMILY MEASURES
1
Parenting Stress Index
Child Related
1
Other Related
1
Family Adaptation and
Cohesion Evaluation Scales
Adaptation
1
Cohesion
1
Family Support Scale
1

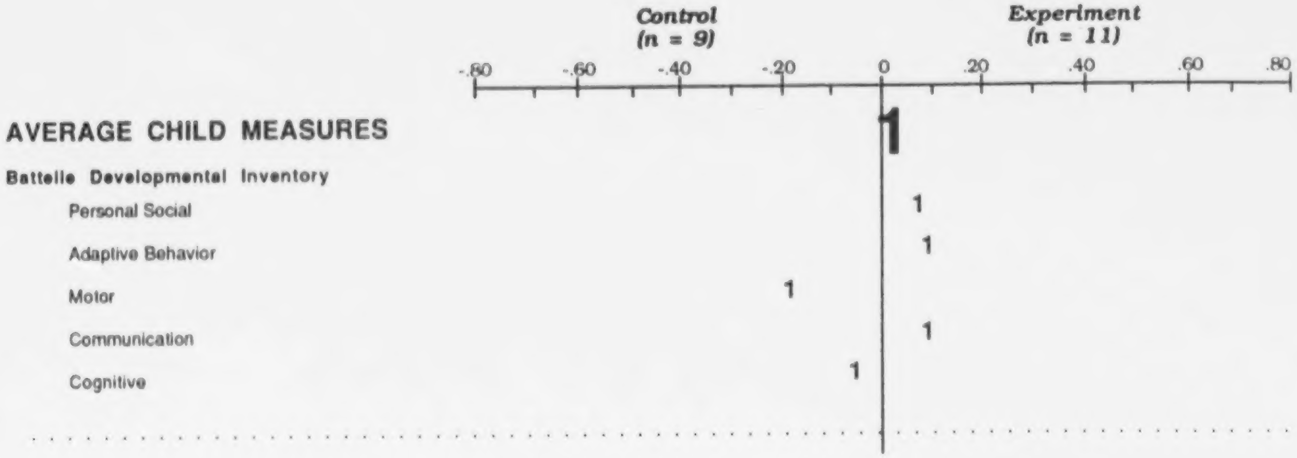
BELLVILLE INTENSITY STUDY

Design

- *24 mild to moderate varied handicaps randomly assigned to indirect or home-based group age 0-3*

Indirect	Home-based
• Only services experienced were those sought out by parents	• twice-weekly home visits
• Twice-monthly sharing group (parent meeting)	• better access to PT/OT and speech and language services
	• multidisciplinary team met and discussed subject and developed plan

BELLEVILLE


Control
(n = 9)
Experiment
(n = 11)
-.80
-.60
-.40
-.20
0
.20
.40
.60
.80
AVERAGE CHILD MEASURES
1
Battelle Developmental Inventory
Personal Social
1
Adaptive Behavior
1
Motor
1
Communication
1
Cognitive
1

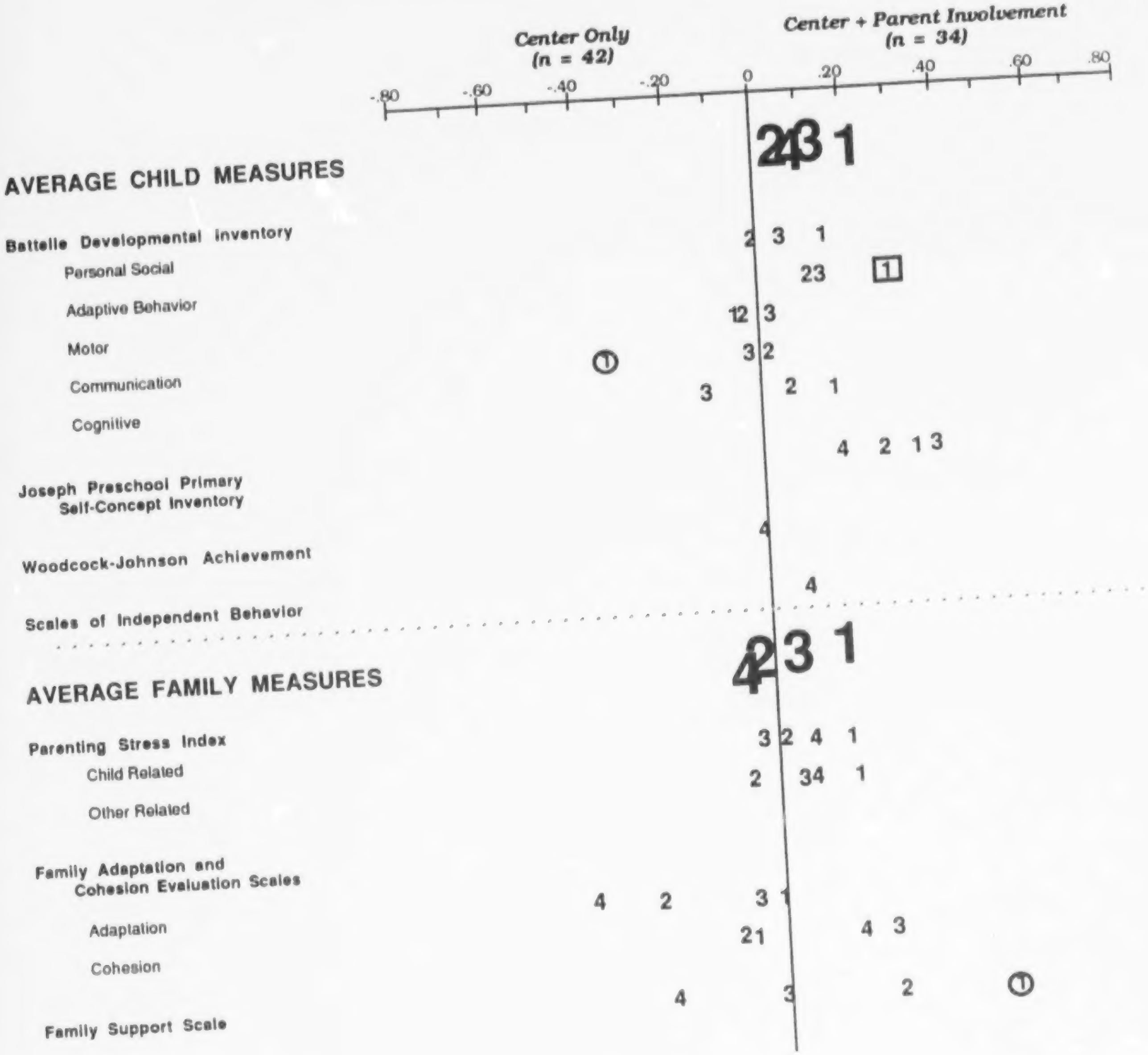
DES MOINES PARENT INVOLVEMENT STUDY

Design

- ***76 mild to severely handicapped children randomly assigned to 2 intervention groups***

Center-Based Intervention	Center-Based Intervention + P.I.E. Curriculum
• 5 days per week; 2-1/2 hours per day	• 5 days per week; 2-1/2 hours per day
• 10 children per class	• 10 children per class
• Certified teachers by aides	• Certified teachers assisted by aides
• 5:1 child/teacher ratio	• 5:1 child/teacher ratio
• Therapists in class 1 time per week	• Therapists in class 1 time per week
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	P.I.E. I
	• Parents attended 16, 2-hour sessions approximately once per week.
	• Sessions emphasized: --Training in teaching/management skills --Information exchange --Social support and networking
	• Each parent selected and implemented an individually-tailored intervention with their child (15 minutes/day, 3-5 times/week)
	***P.I.E. II** (for subjects receiving 2 years of intervention)*
	• Developed based on parent needs assessment
	• Consisted of 12 2-hour sessions
	• Sessions emphasized: --Information exchange --Family support --Social support

DES MOINES PARENT INVOLVEMENT STUDY



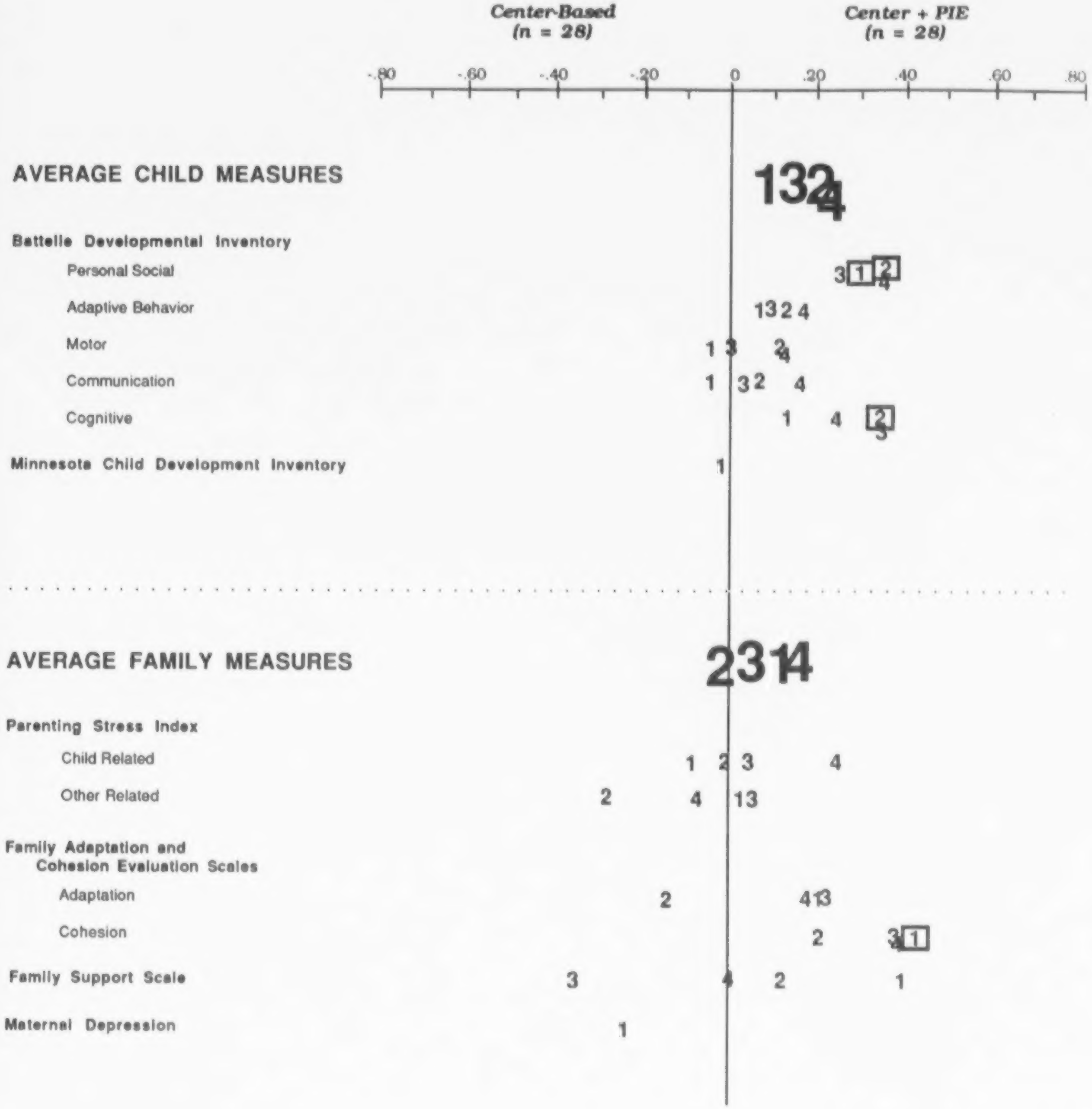
UTAH PARENT INVOLVEMENT '86 STUDY

Design

- *56 moderately to severely handicapped children randomly assigned to 2 intervention groups*

Center-Based Intervention	Center-Based Intervention + P.I.E. Curriculum
• 5 days per week; 3 hours per day	• 5 days per week; 3 hours per day
• 10 children per class	• 10 children per class
• Certified teachers assisted by aides and therapists	• Certified teachers assisted by aides and therapists
• 3.6:1 child/teacher ratio	• 3.6:1 child/teacher ratio
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	• Parents attended 15 2-hour instructional sessions discussing: --observation of child behavior --defining and measuring behavior --theories of child development --criterion-referenced assessment --understanding 94-142 and IEPs --successful intervention strategies --selecting and implementing interventions --communicating with professionals --stress management
	• Social support and networking component
	• Each parent selected and implemented an individually-tailored intervention with their child (15 minutes per day, 3-5 times per week)

Utah Parent Involvement '86



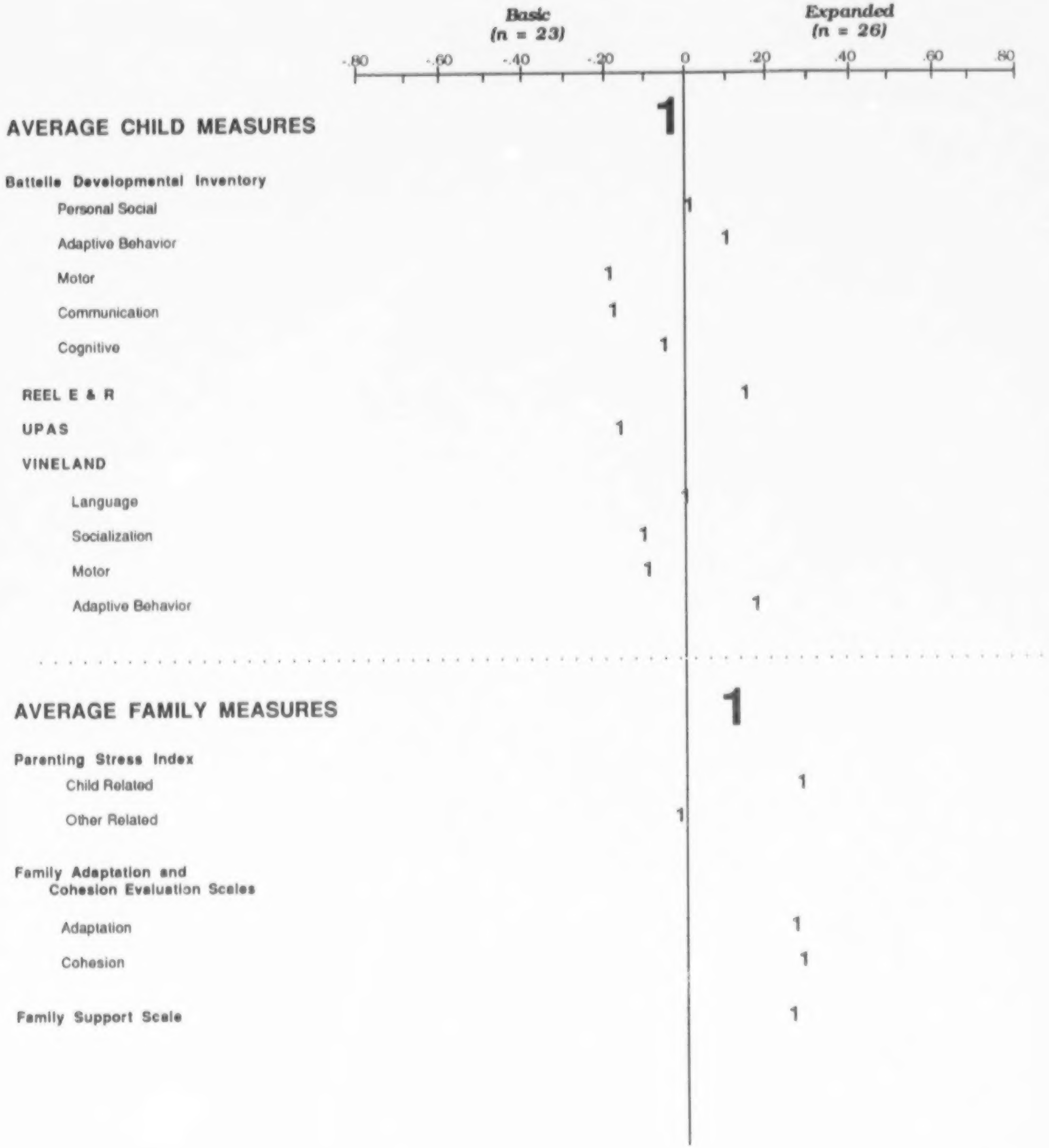
ACDS PARENT INVOLVEMENT STUDY

Design

- ***49 infants and toddlers with Down Syndrome randomly assigned to the center or center plus parent involvement group.***

Center-Based	**Center-based Plus Parental Involvement**
• Down Syndrome subjects between between 3 months and 5 years	• Down Syndrome subjects between between 3 months and 5 years
• Broadbased "Piagetian" Curriculum	• Broadbased "Piagetian" Curriculum
• Extensive program comprised of staff, a social worker, psychologists, nurses, a speech pathologist, phyiscal therapists, occupational therapists, dance specialist, and volunteers	• Extensive program comprised of staff, a social worker, psychologists, nurses, a speech pathologist, phyiscal therapists, occupational therapists, dance specialist, and volunteers
• A number of optional services offered	• A number of optional services offered
	• Weekly calls from a social worker or psychologist
	• Regular training in behavior techniques
	• Regular follow-up of treatment
	• Special emphasis on subject's individual goals

ACDS


Basic
(n = 23)
Expanded
(n = 26)
-.80
-.60
-.40
-.20
0
.20
.40
.60
.80
AVERAGE CHILD MEASURES
1
Battelle Developmental Inventory
Personal Social
1
Adaptive Behavior
1
Motor
1
Communication
1
Cognitive
1
REEL E & R
1
UPAS
1
VINELAND
Language
1
Socialization
1
Motor
1
Adaptive Behavior
1
AVERAGE FAMILY MEASURES
1
Parenting Stress Index
Child Related
1
Other Related
1
Family Adaptation and Cohesion Evaluation Scales
Adaptation
1
Cohesion
1
Family Support Scale
1

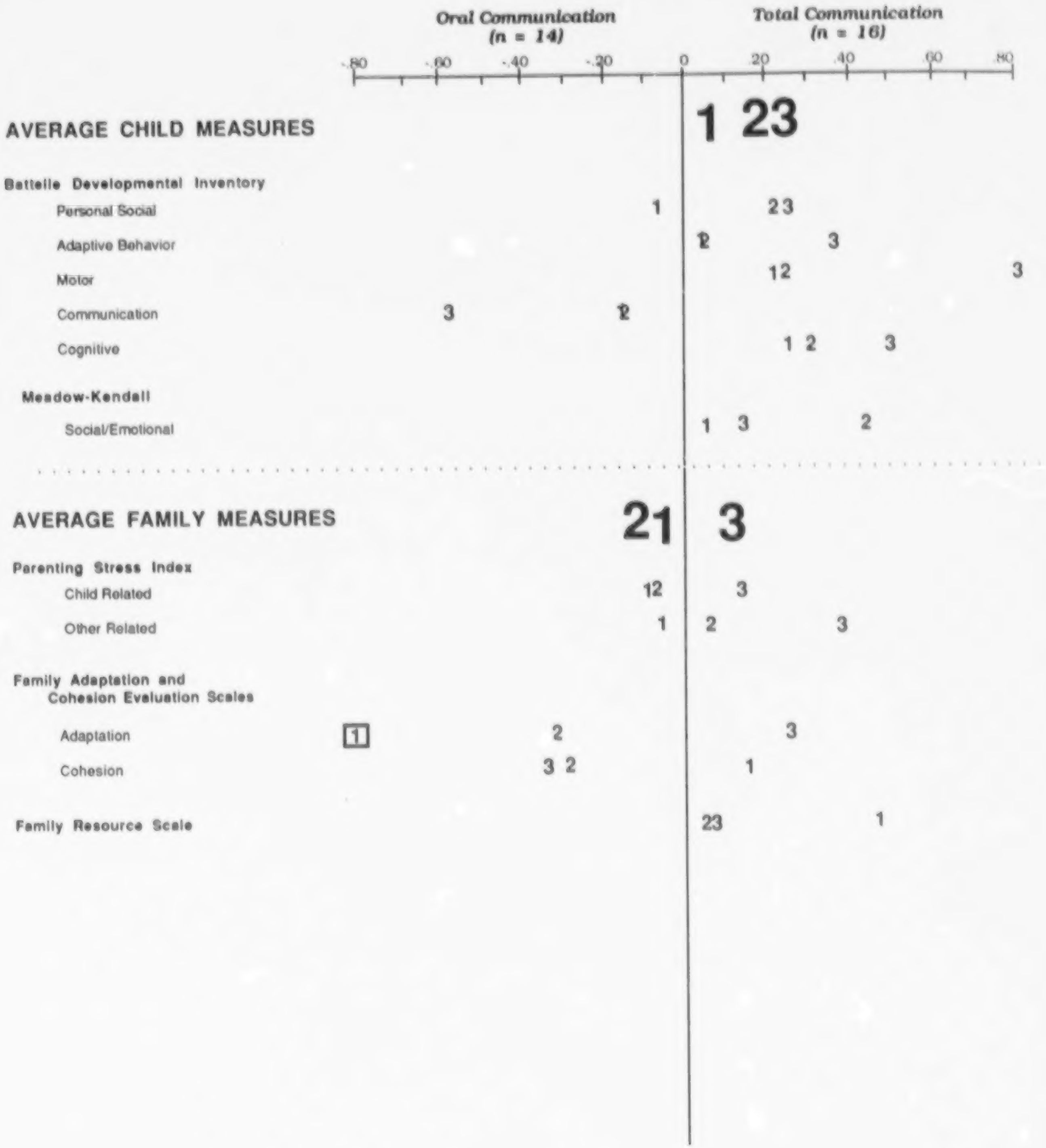
ARKANSAS HEARING IMPAIRED STUDY

Design

- *32 preschool hearing impaired children randomly assigned to the oral/aural learning technique or the total communication training.*

Indirect	Home-based
• Well developed center-based program	• well developed center-based program
• Frequent home visits by teacher	• frequent home visits by teacher
• Training consisted of oral/aural techniques only (no hand-signing)	• techniques consisted of both oral/aural stimulation and sign language

ARKANSAS HEARING IMPAIRED



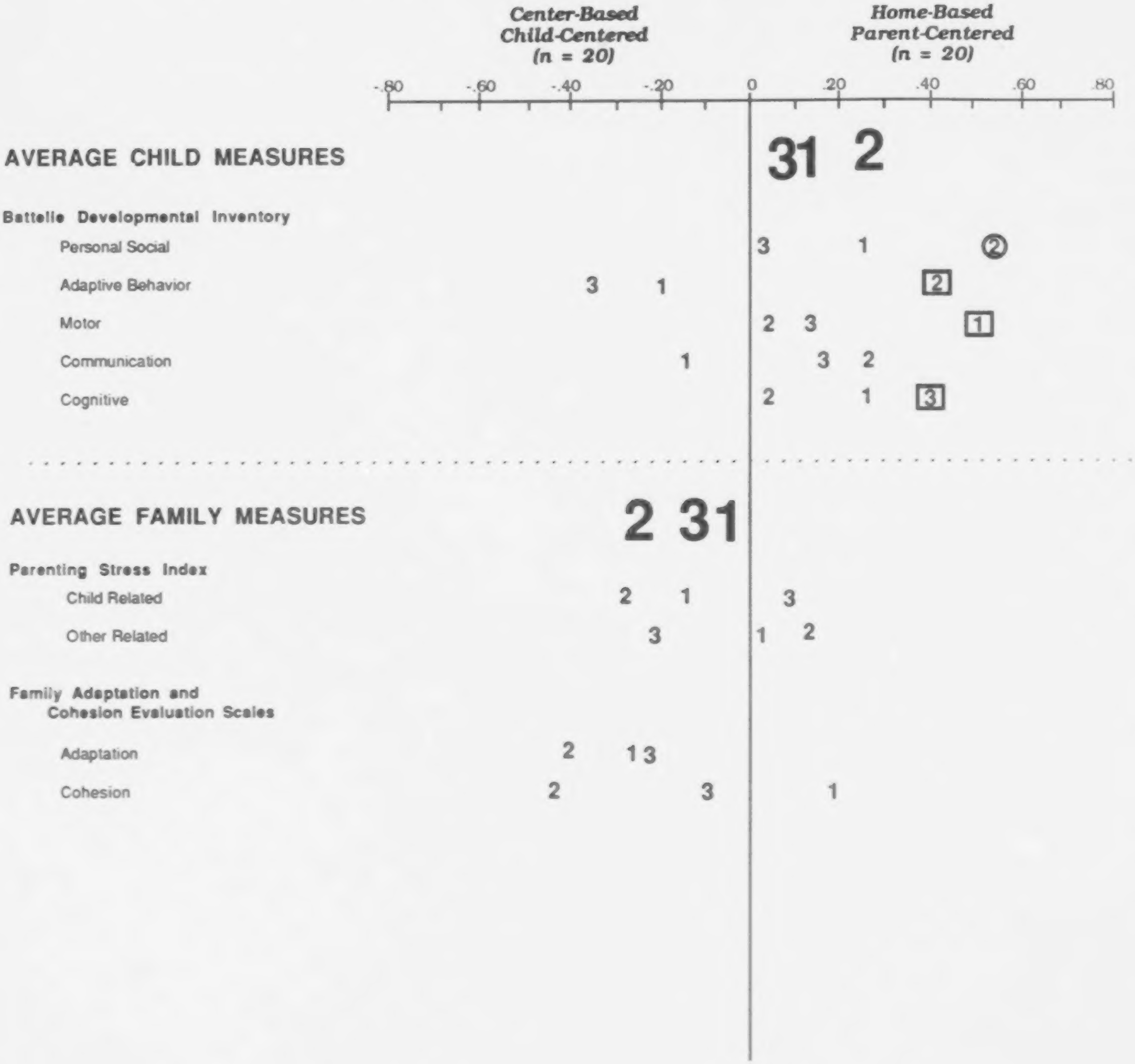
PITCH PARENT INVOLVEMENT STUDY

Design

- *40 speech impaired children randomly assigned to alternative intervention groups.*

Clinic-based, Child-Centered	Home-Based, Parent-Centered
• Weekly, 1-hour therapy provided by certified therapist to pairs of children	• Twice per month, 40-minute home visits by certified therapist to train mothers to do therapy
• Parents transported children to therapy but were not present for therapy	• Mothers expected to provide a minimum of 20 to 30 minutes of therapy four times weekly
• Therapist spent average of 20 hours per week for caseload of 20 children	• Therapist spent average of 20 hours per week training 20 mothers to deliver therapy
• Intervention used combination of phonetic and phonological approaches as well as language skill training	• Mothers trained to use a combination of phonetic and phonological approaches as well as language skill training

PITCH


Center-Based
Child-Centered
(n = 20)
Home-Based
Parent-Centered
(n = 20)
-.80
-.60
-.40
-.20
0
.20
.40
.60
.80
AVERAGE CHILD MEASURES
31 2
Battelle Developmental Inventory
Personal Social
3 1 ②
Adaptive Behavior
3 1 2
Motor
2 3 1
Communication
1 3 2
Cognitive
2 1 3
AVERAGE FAMILY MEASURES
2 31
Parenting Stress Index
Child Related
2 1 3
Other Related
3 1 2
Family Adaptation and
Cohesion Evaluation Scales
Adaptation
2 13
Cohesion
2 3 1

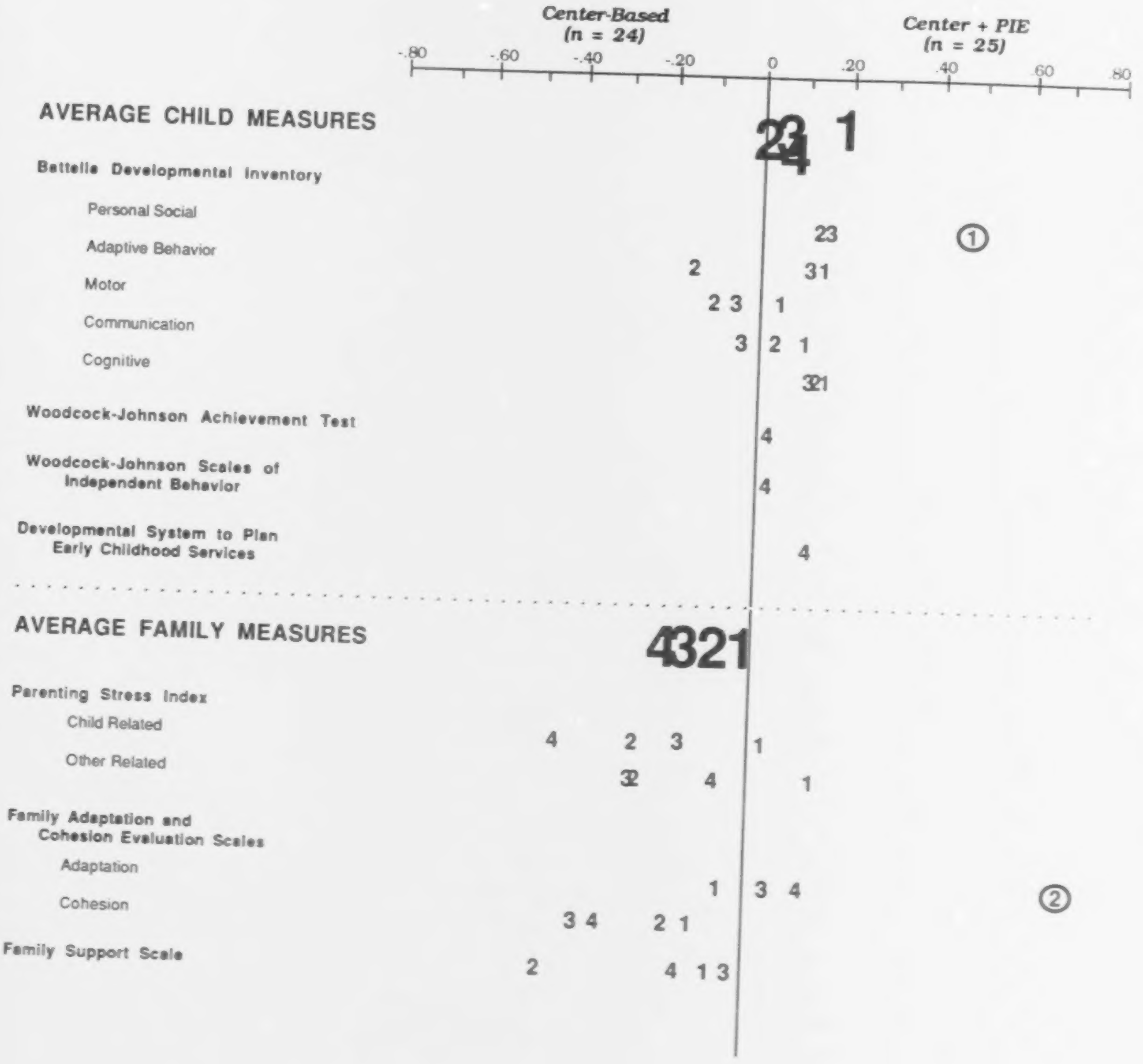
UTAH PARENT INVOLVEMENT '85 STUDY

Design

- ***51 moderately to severely handicapped children randomly assigned to 2 intervention groups***

Center-Based Intervention	**Center-Based Intervention + P.I.E. Curriculum**
• 5 days per week; 3 hours per day	• 5 days per week; 3 hours per day
• 10 children per class	• 10 children per class
• Certified teachers assisted by aides and therapists	• Certified teachers assisted by aides and therapists
• 3.6:1 child/teacher ratio	• 3.6:1 child/teacher ratio
• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development	• Intervention based on IEPs using variety of curricula. Emphasis on motor, language, self-help, social skills, and cognitive development
	• Parents attended 15 2-hour instructional sessions discussing: --observation of child behavior --defining and measuring behavior --theories of child development --criterion-referenced assessment --understanding 94-142 and IEPs --successful intervention strategies --selecting and implementing interventions --communicating with professionals --stress management
	• Social support and networking component
	• Each parent selected and implemented an individually-tailored intervention with their child (15 minutes per day, 3-5 times per week)

Utah Parent Involvement '85



PART IV: DISSEMINATION, GRADUATE STUDENT TRAINING, AND ADVISORY COMMITTEE

An important part of the workscope for this project involved dissemination of findings, training of graduate students, and convening of an advisory committee. Activities in each of those areas are described below.

DISSEMINATION

The institute outlined an ambitious dissemination plan in its original proposal. This plan included 12 major activities. Table 1 on the following page presents the activities proposed, along with a brief description.

During the five years of the project, the institute received approximately 700 inquiries per year regarding working papers and publications of the institute. The institute also sponsored three conferences: (1) a conference on assessment issues; (2) a conference on parent involvement; and (3) a national conference in Washington, D.C., which featured the research findings from research institutes located at utah State University, University of North Carolina, and the University of Pittsburgh, as well as leading professionals in the field. Over 600 persons attended this conference. Brief articles describing the institute and its ongoing research were printed in a wide variety of newsletters and professional publications over the five-year period.

It should also be noted that institute staff provided free consultation to a multitude of agencies. Staff provided information regarding research designs, statistical methods, teaching practices, therapy, parent involvement, child assessment, economic analysis, and review of the research to practitioners, other researchers, and public leaders. These have included the state departments of education in South Carolina, Florida, Texas, Mississippi, Ohio, Rhode Island, Virginia, Massachusetts, Utah, Connecticut, Minnesota, Illinois, California, New

Table 1

Summary of Dissemination Plan

ACTIVITY	DESCRIPTION
1. Capability of Utah as a member of the nationwide network of University Affiliated Facilities for the Developmentally Disabled	Utah State University is a member of a network of 47 University Affiliated Facilities (UAFs) throughout the United States. One of the primary missions of UAFs is the dissemination of information about providing effective services to handicapped people. Consequently, UAF staff were heavily involved in numerous organizations and activities which contributed to the dissemination of information from EIEI. For example, DCHP staff have regular contact and/or serve on councils for the Developmentally Disabled in Utah, Idaho, and Wyoming; the DCHP sponsored and provided support services to two satellite UAFs in Montana and on the Navajo reservation in Arizona; the DCHP board of directors included representation from the Utah Division of Health, local school districts, related university departments, and parents; the DCHP advisory board included people from a five-state area who were associated with the provision of services to handicapped individuals; and copies of the DCHP annual report were distributed each year to over 200 people throughout the United States. In all of these contacts, information about EIEI, its findings, and products, were disseminated without any cost to the institute.
2. Existing UAF training activities separate from EIEI	A second primary thrust of UAF programs was the training of people responsible for providing services to handicapped individuals. These training activities included both preservice and inservice in a wide variety of areas. Each year DCHP staff provided 1,832 student student credit hours of university coursework and practica, and 29 workshops involving a total of 901.5 person contact hours. Virtually all of these training activities also served a dissemination function, many of which were directly relevant to the provision of services to young handicapped children. Findings and products from the institute were disseminated through these training activities with no cost to the institute.
3. Publications	Findings and information about products developed by the Utah Institute were disseminated through a variety of professional outlets. The research generated articles submitted to professional refereed journals; all applicable products, technical reports, and research summaries were filed with ERIC. Information about the institute and its findings were released to various professional and parent newsletters. Two of these newsletters were published by the DCHP: the *Exceptional News* (a newsletter for providers with a circulation of 2,200) and the *Parent Newsletter* (a newsletter for parents of handicapped children with a circulation of 700) regularly carried information about the activities of EIEI. Other outlets such as the National Association for Retarded Citizens, the *Technical Assistance Development System (TADS) Newsletter*, INTERACT, the National Center for Clinical Infant Programs, and other state newsletters represented dissemination outlets.
4. Conference presentations and information displays.	Findings and information about products were disseminated regularly through professional conferences and meetings. During the first year, no formal papers were presented at such national meetings because of deadlines for submissions. However, the DCHP regularly displays products and information at such conventions. During 1986-87, the institute did two such exhibits, one at CEC's annual meeting and the second at the TASH annual meeting. Displays distributed information about the mission, activities, and findings of the institute. In subsequent years of the institute, numerous professional presentations were made. The institute funded travel and per diem for four people to conventions each year, but many more presentations were made with travel costs being covered by other funds.
5. Summer conferences and workshops at Utah State University	Each year for the past 10 years, Utah State University's Department of Special Education, in conjunction with the DCHP, has sponsored a Special Education Intervention Conference which is attended by approximately 100 people throughout the Western United States. The Head of the Department of Special Education agreed to have at least one session of this Intervention Conference sponsored by EIEI each year. In addition, Utah State University's Lifespan learning Center, a division of Continuing Education, sponsors numerous workshops each summer on a variety of topics. Once such workshop is the Infancy and Early Childhood Conference, a week-long workshop co-sponsored by the institute.

Table 1 (continued)

Summary of Dissemination Plan

ACTIVITY	DESCRIPTION
6. Special net Early Childhood Bulletin Board	A member of the institute staff has coordinated the information dissemination activities of this bulletin board. This made it very easy to routinely include information about the institute on this network. This information reached educators in every state in the nation.
7. Newspaper and television coverage.	Regional newspaper and television stations routinely cover significant activities of the Utah UAF. Staff from the institute worked with USU public information specialists to actively seek out this type of information coverage, as well as to work with Public Broadcasting stations.
8. Placement of trainees	Some of the most effective and long-term dissemination of institute findings and products occured through the placement of graduate students and research assistants trained by the institute. The UAP has already established an excellent track record in this area. A number of students who have participated in the interdisciplinary training program of the two programs are working in areas directly related to the provision of services to preschool children with handicaps. Emphasis on the person's interest in working with preschool children was used in recruiting graduate and research assistants.
9. Annual distribution of findings and products	As a part of its dissemination efforts, the institute developed a brief executive summary of its activities and accomplishments for each year, including a listing of publications, products, and technical reports which be disseminated free of charge to a broad audience of people and organizations interested in early intervention with handicapped children (approximately 200 people). This distribution list was compiled by identifying one person in each state (either education, social services, or health) who was in a key position relative to the provision of early intervention services in that state, and asking each to nominate one other person in their state who ought to be included. HCEEP project directors and former project directors and university-based researchers with demonstrated interest in the area were also included.
10. Attendance at semi-annual institute meetings	Two or more people from the institute attended the semi-annual institute meetings in Washington, D.C., and participated fully in its proceedings.
11. Holding advisory committee meetings as part of a national convention	During year 1, one advisory committee meeting was held in conjunction with the Division of Early Childhood annual convention. This advisory committee meetings was structured so that the institute receives input from the advisory committee and so that the advisory committee could serve a dissemination function to conference participants.

York, Arizona, Washington, and Nebraska; the offices of Senators Orrin Hatch, Lowell Weicker, Edward Kennedy, Chris Dodd, Tom Harkins, and Congressman Wayne Owens; the Utah State Legislature; the National Council of State Governments; and researchers in such diverse locations as England, Denmark, Germany, China, Ecuador, Norway, and New Zealand, Russia, as well as throughout the United States.

The institute, as noted in the dissemination plan, co-sponsored five summer workshops focusing on early childhood research issues. Approximately 400 early intervention professionals from around the United States attended these workshops. Presenters included the following nationally recognized scholars.

1986

Victor Denenberg
Evelyn Thoman
Artin Goncu
Michael Lewis
Sam Meisels

1987

Lewis Lipsett
Clair Kopp
Joseph Fagan
Donald Routh
Frank Pederson

1988

Nancy Eisenberg
Francis Hordwetz
Philip Zeskind
Marion Radke Yarrow
Debra Vandall

1989

Hill Goldsmith
Stephen Svomi
Alan Fogel
Jay Belsky
Howard Markman

1990

Robert Bradley
Theodore Wachs
Nathan Fox
Tiffany Field
Carolyn Zahn-Waxler

In terms of publications and presentations, the institute was remarkably productive. Over the five-year institute period, 31 chapters in books, 64 refereed publications, and 124 papers and invited presentations were produced by institute staff.

Appendix A contains a complete listing of staff publications and presentations.

TRAINING GRADUATE STUDENTS/RESEARCH ASSISTANTS

Criteria for Graduate/Research Assistants

An integral part of the institute's activities was to provide advanced research training for research and graduate assistants from several disciplines. The majority of graduate assistants came from six disciplines: Special Education, Psychology, Communicative Disorders, Economics, Social Work, and Family and Human Development. Research assistants, as a term employed in this report, refers to both staff research positions and graduate students. Staff researchers were professional personnel, usually at the junior level, with a Bachelors or Masters Degree. Graduate students were part-time personnel who attended classes and received a stipend for work up to 50% FTE on a project. We projected that at least 10 graduate/research assistants per year would be involved in the institute's activities. In actual fact, a total of 77 graduate students received a substantial amount of training over the five-year contract period.

Training of Graduate/Research Assistants

Two modes of training were employed to provide graduate assistants with relevant research skills and experience. These modes are described below.

DCHP interdisciplinary training. Utah State University (USU) is a part of a nationwide network of University Affiliated Facilities (UAFs) which receive core support funding from the Administration on Developmental Disabilities. A major thrust of all UAF programs is to provide interdisciplinary training to persons who are or will be providing services to persons with developmental disabilities. Some of the training offered to graduate/research assistants at USU occurred at no cost to the institute because of student's participation in existing interdisciplinary training programs at the DCHP. Interdisciplinary training is a primary mission of the Utah UAF; therefore, all students who work on research projects were enrolled for 9 credits of interdisciplinary course work. All graduate students met with the

DCHP director of interdisciplinary training and constructed interdisciplinary training plans (ITPs) that outlined specific course work and internship experiences (other than the project to which they were assigned). Through this program, it was possible to extend practica opportunities to students outside the project staff to learn specific procedures for data collection and analysis (e.g., cost-effectiveness workshops).

Project-related training. Every aspect of the institute's activities provided research assistants with training opportunities. As a component of ongoing research activity, formal inservice training, research seminars, planning meetings, and tutorials with senior research staff were conducted to help research assistants understand the rationale, design, and procedures of the proposed studies. Participation in activities within a particular research option also gave students experience in data collection and analysis, reporting and disseminating findings, developing materials, and conducting training. Many other secondary skills were also developed by participation (e.g., working as a member of an interdisciplinary team, constructing questionnaires, planning the logistics and content for advisory committee meetings, and dealing with political problems in the field.

Evaluation of Training

Four sources of information were used to document and evaluate the training the research assistants received. First, the director of the DCHP Interdisciplinary Training did an annual assessment of graduate student progress toward achieving the goals listed in their ITPs. A compilation of the progress reports were reviewed by the Project Director prior to staff meetings to assist in making assignments. A second evaluation was more informal and consisted of meetings between senior research staff and individual research assistants to discuss progress in meeting research objectives.

Two final evaluation activities took place after the research assistants completed their assignment with the institute. First, a record of professional publications and presentations in which the graduate student participated. Finally, a follow-up on the professional placement of institute assistants assessed the usefulness of skills learned during the project. As will be noted in the dissemination section, graduate students were very productive.

In addition, as part of the institutionalized personnel evaluation procedures at Utah State University, all graduate students received a written evaluation at the mid point of each year by their direct supervisor. This process was expanded for graduate students working on the institute to allow them an opportunity to anonymously complete a brief written evaluation of the institute vis-a-vis their training experience. Results were used to make necessary adjustments to make their experience more profitable.

Table 2 lists each graduate student by name, disciplines, and prior degrees. In addition, a brief description of their individual experiences is given as noted earlier. All graduate students have also completed the interdisciplinary training offered by the Developmental Center for Handicapped persons, which entails progressing through 12 modules on special education and attending optional lectures on topics such as "Using Economic Analyses ni Research" or "Expert Systems in Special Education." Also, EIRI staff have conducted training for many of the graduate students in administration and scoring of test batteries, data analyses for the longitudinal studies, data monitoring, and computer skills.

Table 2

Graduate Students

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
1985-86			
Vanessa Moss	Research and Evaluation Ph.D.	B.S. Brigham Young University M.S. Brigham Young University	• Literature review • Coding articles
Steven Cook	Clinical Psychology Ph.D.	B.S. Brigham Young University	• Preparation of articles • Assist w/site coordination • Code articles
Colette Escobar	Economics, M.S.	M.S. Utah State University	• Perform cost analysis • Preparation of articles • Presentation at conferences

Table 2

Graduate Students (continued)

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
Glenn Goodwin	Clinical Psychology Ph.D.	BA Evangel College MA University of North Florida	* Follow-up of IVH preschoolers * Preparation of articles
Janet Millard	Clinical Psychology Ph.D.	BS Westminster College MS Texas Women's University	* Site coordination * Literature review * Presentation at conferences
Bernard Wazlavek	Clinical Psychology Ph.D.	BA Western Maryland MA Towson State	* Site coordination * Manage data base * Presentation at conferences
Gary Goodrich	Clinical Psychology Ph.D.	BS Brigham Young University MS Utah State University	* Code articles * Preparation of articles
Alan Muhlstein	Clinical Psychology Ph.D.	BS Southern Utah State College MS Utah State University	* Site coordination * Administer/score tests
Matthew Taylor	Research and Evaluation Ph.D.	BS Utah State University MS Utah State University	* Code articles * Perform data analysis
1986-87			
Ellen Frede	Family and Human Development, Ph.D.	BA University of Michigan MA Pacific Oaks College	* Revise treatment verification onsite evaluation procedures * Grant writing * Preparation of articles * Presentation at conferences
Terilee Wingate-Corey	Clinical Psychology Ph.D.	BS Weber State University MA University of Missouri	* Site coordination * Grant writing * Data analysis * Preparation of articles * Presentation at conferences
Todd Braeger	Clinical Psychology Ph.D.	BS South Dakota State Univ.	* Assist w/site coordination * Administer child/family measures * Data analysis
Robert Bailey	Clinical Psychology Ph.D.	BS Brigham Young University MS Henderson State University	* Administer and score tests * Conduct telephone surveys * Assist in literature reviews * Analyze data
Carl Summers	Research and Evaluation Psychology, Ph.D.	BS Brigham Young University MS University of Utah MA University of Nebraska	* Grant writing * Data analysis
John J. Shamaly, Jr.	Clinical Psychology Ph.D.	BS Northeastern University	* Site coordination * Data analysis * Presentation at conferences
Richard Elghammer	Clinical Psychology Ph.D.	BA Baylor University BA Knox College MS Eastern Illinois University	* Child and Family assessment * Data analysis * Presentation at conferences
Mary Ann Hanson	Fine Arts, M.F.A.	BA Moorhead State MS University of Washington	* Literature review * Child and Family assessments * Preparation of articles
Arunoday Saha	Economics, Ph.D.	BS Calcutta University MS Calcutta University	* Economic analysis * Cost data collection * Data analysis

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Table 2

Graduate Students (continued)

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
1986-87 (continued)			
William Corey	Clinical Psychology Ph.D.	BA University of Missouri MS Utah State University	• Grant writing • Oversee IVH follow-up study • Data analysis • Preparation of articles • Presentation at conferences
Mark Innocenti	Analysis of Behavior Psychology, Ph.D.	BS Northeastern University MS Utah State University	• Supervise clerks/students • Site coordination • Data analysis • Preparation of articles • Presentation at conferences • Grant writing
David Calhoun	Clinical Psychology Ph.D.	BS San Jose State University	• Assist w/site coordination • Data analysis • Literature review
Steven Curtis	Clinical Psychology Ph.D.	BA UCLA MS Utah State University	• Assist w/site coordination • Literature review • Code articles
Helal Mobasher	Sociology	MS Utah State University	• Data Analysis • Grant writing • Data code book
Kwi-Sun Huh	Developmental Psychology, Ph.D.	BA Seoul Women's University MA Seoul Women's University	• Data analysis • Check scoring of tests • Presentation at conferences • Preparation of articles • Assist in Literature Reviews
Judith Waidler	Clinical Psychology Ph.D.	BS Portland State University MS San Jose State University	• Assist w/site coordination • Administer and score tests • Data analysis
Jyme Waidler	Communications, M.S. Technology, MS	BA California State University at Hayward	• Data analysis • Checking test protocols • Consultation on videotaping
Sung-Il Kim	Research and Evaluation Psychology, Ph.D.	BA Korea University MS Utah State University	• Data processing • Data analysis
Eun-hee Shin	Psychology, M.S. Psychology, Ph.D.	BS Ewha University, Korea MA Pacific Oaks College	• Collect, code, analyze data • Literature reviews
1987-88			
Robert Bailey	Clinical Psychology Ph.D.	BS Brigham Young University MS Henderson State University	• Score and administer tests • Conduct telephone surveys • Assist in literature reviews
William Corey	Clinical Psychology Ph.D.	BA University of Missouri MS Utah State University	• Grant writing • Oversee IVH follow-up study • Data analysis • Preparation of articles • Presentation at conferences
Ellen Frede	Developmental Psychology, Ph.D.	BA University of Michigan MA Pacific Oaks College	• Revise treatment verification onsite evaluation procedures • Grant writing • Preparation of articles • Presentation at conferences

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Table 2

Graduate Students (continued)

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
1987-88 (continued)			
Kwi-Sun Huh	Developmental Psychology, Ph.D.	BA Seoul Women's University MA Seoul Women's University	• Data analysis • Check scoring of tests • Presentation at conferences • Preparation of articles • Assist in Literature Reviews
Nancy Immel	Family and Human Development, M.S.	BA Sacramento State College BS Colorado State University	• Coordinate Medicaid Consortium • Site Coordination • Develop database of subjects • Grant writing
Mark Innocenti	Analysis of Behavior Psychology, Ph.D.	BS Northeastern University MS Utah State University	• Supervise clerks/students • Site coordination • Data analysis • Preparation of articles • Presentation at conferences • Grant writing
Helal Mobasher	Sociology, Ph.D.	BA Utah State University MS Utah State University	• Supervision of computer files • Computer consultant • Presentation at conferences • Preparation of articles • Assist in literature reviews
Vanessa Moss	Research and Evaluation Psychology, Ph.D.	BS Brigham Young University MS Brigham Young University	• Assist in integrative review • Assist in literature reviews
Anuradha Parthasarathy	Research and Evaluation Psychology, Ph.D.	BA National College, Bangalore India	• Assist in integrative review
Darrell Peatross	Instructional Technology, MS	BS Utah State University	• Preparing research reports • Data analysis • Grant preparation • Article preparation
Arunoday Saha	Economics, Ph.D.	BS Calcutta University MS Calcutta University	• Data analysis • Analysis of cost data • Literature reviews
Pamela Sapyta	Sociology, M.S.	BS Utah State University	• Collect, code, analyze data
Eun-hee Shin	Psychology, M.S. Psychology, Ph.D.	BS Ewha University, Korea MA Pacific Oaks College	• Collect, code, analyze data • Literature reviews
Carl Summers	Research and Evaluation Psychology, Ph.D.	BS Brigham Young University MS University of Utah MA University of Nebraska	• Grant writing • Data analysis
Marcia Summers	Developmental Psychology, Ph.D.	BS Brigham Young University MS University of Nebraska	• Site management • Coordination of coding of parent/child interaction tapes • Grant writing • Presentations at conferences • Preparation of articles
Matthew Taylor	Research and Evaluation Psychology, Ph.D.	BS Utah State University MS Utah State University	• Assist in integrative review • Grant writing
Terilee Wingate-Corey	Clinical Psychology Ph.D.	BS Weber State University MA University of Missouri	• Site coordination • Grant writing • Data analysis • Preparation of articles • Presentation at conferences

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Table 2

Graduate Students (continued)

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
1988-89 (continued)			
Jyme Waidler	Communications, M.S. Technology, MS	BA California State University at Hayward	* Data analysis * Checking test protocols * Consultation on videotaping
Bernard Wazlavek	Clinical Psychology Ph.D.	BA Western Maryland College MA Towson State University	* Data analysis * Data management * Coordinate data collection * Grant writing
Claudia Weber	Developmental Psychology, M.S.	BS University of Minnesota	* Data analysis * Score tests * Oversee clerks * Literature review
1988-89			
Robert Bailey	Clinical Psychology Ph.D.	BS Brigham Young University MS Henderson State University	* Score and administer tests * Conduct telephone surveys * Assist in literature reviews * Analyze data
Richard Cook	Research and Evaluation Psychology, Ph.D.	AA Moberly Area Jr. College BS Lincoln University	* Score and code tests * Computer programming * Data Analysis * Preparation of articles
Rebecca Crawford	Clinical Psychology Ph.D.	BA University of Montana MEd Montana State University	* Score and code tests * Coordinate incoming data * Data analysis
Grant Gong	Research and Evaluation Psychology, Ph.D.	MA Beijing University, China	* Data processing * Data analysis
Kwi-Sun Huh	Developmental Psychology, Ph.D.	BA Seoul Women's University MA Seoul Women's University	* Supervision of clerks * Data analysis * Preparation of articles * Assist in literature reviews * Assist in manual preparation
Sung-Il Kim	Research and Evaluation Psychology, Ph.D.	BA Korea University MS Utah State University	* Data processing * Data analysis
Vanessa Moss	Research and Evaluation Psychology, Ph.D.	BS Brigham Young University MS Brigham Young University	* Assist in integrative review * Assist in literature review
Anuradha Parthasarathy	Research and Evaluation Psychology, Ph.D.	BA National College, Bangalore India	* Assist in integrative review
Donald Piburn	Early Intervention Special Education, M.S.	BS Utah State University	* Code, check, analyze data * Assist in literature review
Eun-Hee Shin	Psychology, M.S.	BS Ewha University, Korea	* Collect, code, analyze data * Assist in literature review
Matthew Taylor	Research and Evaluation Psychology, Ph.D.	BS Utah State University MS Utah State University	* Assist in integrative review * Grant writing
Martin Toohill	Pro-Sci (clinical) Research and Evaluation Ph.D.	BA College of St. Thomas MS New Mexico Highlands	* Data analysis * Administer and score tests
Claudia Weber	Developmental Psychology, M.S.	BS University of Minnesota	* Data analysis * Score tests * Oversee clerks * Assist in literature review

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Table 2

Graduate Students (continued)

Student	Discipline and Degree Program	Prior Degrees	Description of Activities
1989-90			
James Akers	Family and Human Development, MS	BS University of Southern California	* Data Analysis * Assist in report writing * Assist in literature review * Score tests
Richard Cook	Research and Evaluation Psychology, Ph.D.	AA Moberly Area Jr. College BS Lincoln University	* Score and code tests * Computer programming * Data analysis * Preparation of articles
Mike Cummings	Clinical Psychology Ph.D.	BS Augustana University	* Case management * Data analysis
Lolanda DeClay	School Psychology M.S.	BS Northern Arizona University	* Case management * Literature review
Sheryl Dagang	Analysis of Behavior Ph.D.		* Data Analysis * Administer and score tests
Grant Gong	Research and Evaluation Psychology, Ph.D.	MA Beijing University, China	* Data processing * Data analysis
Kwi-Sun Huh	Developmental Psychology, Ph.D.	BA Seoul Women's University MA Seoul Women's University	* Data analysis * Check scoring of tests * Preparation of articles * Assist in literature review
Miriam Jennings	Family and Human Development, MS	BA Brigham Young University	* Data analysis * Check scoring of tests * Preparation of articles * Assist in literature review
Sung-Il Kim	Research and Evaluation Psychology, Ph.D.	BA Korea University MS Utah State University	* Data processing * Data analysis
Donald Piburn	Early Intervention Special Education, M.S.	BS Utah State University	* Code, check, analyze data * Assist in literature review
Leslie Pond	Severe K-12 Special Education, M.Ed.	BS University of Denver	* Case manager * Review of literature * Home visiting
Rula Qalyoubi	Economics	BS University of Jordan	* Data analysis * Analysis of cost data * Preparation of articles
Eun-Hee Shin	Psychology, M.S.	BS Ewha University, Korea	* Collect, code, analyze data * Assist in literature review
Matthew Taylor	Research and Evaluation Psychology, Ph.D.	BS Utah State University MS Utah State University	* Assist in integrative review * Grant writing
Martin Toohill	Pro-Sci (clinical) Research and Evaluation Ph.D.	BA College of St. Thomas MS New Mexico Highlands	* Data analysis * Administer and score tests
Claudia Weber	Developmental Psychology, M.S.	BS University of Minnesota	* Data analysis * Score tests * Oversee clerks * Assist in literature review

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ADVISORY COMMITTEE

In developing our response to RFP 85-104, we proposed an advisory committee which included eight members. Two of these members were unable to serve and were replaced. We added a ninth member, Dr. Steve Warren, who was a member of the Division of Early Childhood Research Committee. Our advisory committee members, together with their areas of expertise, are depicted in Table 3 on the following page.

Five advisory committee meetings were held. Two were held during the first year of the project, one was held during Year 2, a third during Year 3, and a fourth at the end of Year 5 when we were moving into the follow-up phase of the research.

To increase the probability of receiving useful input from the advisory committee, the following strategies were utilized.

1. An agenda for the meetings was established 30 days in advance after consultation with SEP. The agenda was circulated to committee members for comment and revision as well as to assist in members' preparation.
2. Specific assignments with due dates and a contact persons were given to members prior to, during, and in between meetings. The contact persons was responsible for follow-up.
3. A closed session was held at the conclusion of each advisory committee meeting for members to evaluate and provide feedback to the staff about accomplishments, plans, and products of the institute, and the content of a particular meeting.
4. A written report was distributed within 30 days of each advisory committee meeting summarizing the recommendations made and the proposed or completed action. Similar records were kept of advice given in between meetings. This compilation served as the first item on the next meeting agenda.

As noted earlier, two meetings of the national advisory committee of the longitudinal studies were held during the first nine months of the contract. As per the original proposal, the first meeting was held in conjunction with the National Early Childhood Conference on Children with Special Needs, sponsored by the Council for Exceptional Children and the Division of Early Childhood. Holding the meeting in conjunction with such a national meeting occurred in order to provide an

Table 3

Membership of Early Intervention Effectiveness Institute Advisory Committee

Name	Position	Qualification
Craig Ramey, Ph.D.	Professor of Psychology, Director of Research at the Frank Porter Graham Child Development Center, University of North Carolina	Since 1975, Dr. Ramey has directed the Carolina Abecedarian Project and Project CARE--two projects assessing the longitudinal effect of early intervention with "high risk" and developmentally delayed children. He has been active with the Carolina Institute for Research and Early Education and has published over 75 articles on early intervention and developmental psychology.
Richard Darlington, Ph.D.	Professor of Psychology, Cornell University	Dr. Darlington is currently a professor of Psychology at Cornell University, He had developed an international reputation for his expertise in experimental design, statistical analysis, and psychometrics. As the principal data analyst in the Consortium for Developmental Continuity, Longitudinal Studies of Early Intervention Efficacy, he is very experienced in the types of issues which this project will confront.
Marilyn Johnson, Ph.D.	Director, Native American Research and Training Center, Northern Arizona University	As direct of the Native American Research and Training Center, Dr. Johnson is responsible for conducting analyses of research dealing with Native American populations and for originating research dealing with Native American issues. As a member of the advisory committee, Dr. Johnson will bring three perspectives, that of researcher, minority group member, and parent of a handicapped child.
Carl Halton, Ph.D.	State Director of Special Education Delaware State Department of Education	As the state director of Special Education in the Delaware State Department of Education, Dr. Halton has been particularly aggressive in promoting early childhood special education programs within his state. He has also been active in the national association of state directors of special education and has remained professionally involved in issues related to early intervention.
Bud Fredericks, Ph.D.	Director, Teaching Research Div., Oregon Division of Higher Education Monmouth, Oregon	Dr. Fredericks has been involved with research and demonstration programs for severely handicapped preschoolers for much of his professional career. He directed a nationally validated preschool program for severely handicapped preschoolers and has published extensively in this area. He is currently serving as president of The Association for the Severely Handicapped.
Diane Bricker, Ph.D.	Director, Early Intervention Program and Professor of Special Education, University of Oregon	Dr. Bricker is one of the foremost authorities in the country with regards to research which deals with language development in the handicapped. She has authored numerous publications in this area of early intervention research issues.
Diana Slaughter, Ph.D.	Associate Professor of Education Program in Human Development and Social Policy, Northwestern Univ.	Dr. Slaughter is an expert is social policy. She has published extensively in areas related to early intervention for Black populations and represented both a research perspective and minority concerns on the advisory committee.

(continued)

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Table 3

Membership of Early Intervention Effectiveness Institute Advisory Committee

Name	Position	Qualification
Alan Crocker, M.D.	Director, Developmental Evaluation Clinic, Children's Hospital Medical Center, Boston, Massachusetts	Dr. Crocker is a past president of the American Association for University Affiliated Facilities and has been extremely active in early intervention activities in the Medical community. He is very active in the National Down Syndrome Congress, and has written extensively about the implementation on early intervention programs. Dr. Crocker serves as an important link to the medical profession and to the Division of Maternal and Child Health in the Federal Government.
Steve Warren, Ph.D.	Associate Professor of Special Education, Vanderbilt University, Nashville, Tennessee	Dr. Warren has been extensively involved in conducting research and providing teacher training programs related to early childhood and serves as a member of the DEC research committee. He was added to the advisory committee at the request of DEC, and serves as a liaison between the activities of the institute and the most important professional organization which is concerned primarily with early intervention services for handicapped children.

opportunity for professionals working in the field of early childhood special education to learn more about the longitudinal studies, and, more importantly, to have input into how those studies would be conducted.

In addition to advertising the advisory committee meetings as being open to the public, Utah State University sponsored a dinner the evening prior to the advisory committee meeting which was attended by approximately 50 leaders in the field of early childhood special education. During this dinner, the goals and objectives of the longitudinal studies were described, the acting director of the Office of Special Education Programs commented briefly on the federal government's perspective about the longitudinal studies, a member of the advisory committee addressed the topic, "The Contribution of Research to Policy and Practice in Early Childhood Special Education," and there was a time for comment and discussion by those attending. Approximately 15 people, in addition to staff and advisory committee members, attended at least part of the advisory committee meetings the following day.

Based on our experience at the first advisory meeting, it was the recommendation of the advisory committee that the second meeting be held in conjunction with the national CEC meeting in New Orleans the following April. this was done with similar success, as 25 to 30 early childhood special education professionals attended some part of the advisory committee meeting. Because there was no similar meeting at the time that the advisory committee recommended the next meeting be held (January, 1987), it was decided that the next meeting would be held in Salt Lake City near the end of January. However, it was our conclusion, with agreement from the advisory committee, that the strategy of soliciting input from the field and providing visibility for the longitudinal studies by holding the meetings in conjunction with national professional meetings had been beneficial and should be considered again for the future.

Examples of how input from our advisory committee helped shape the research effort is given below.

At the first advisory committee meeting, it was emphasized that Option 1 should focus on comparisons of intensity of treatment rather than "treatment vs. no treatment" comparisons. This position was consistent with the original RFP, and is clearly reflected in the types of studies described earlier in this report. Advisory Committee members also emphasized that Utah State University needed to retain responsibility for randomly assigning subjects to groups. The importance of this has been affirmed by our experienced during the five years. The advisory committee also emphasized the need for EIRI to raise additional money in order to conduct the research as comprehensively as possible. They particularly emphasized the need to broaden the pre-intervention and outcome measures, and the desirability of having some control over the funding of services at each site. This advice was instrumental in guiding many of the activities of institute staff in both the instrumentation area as described previously, and in the fund raising area. Other examples of how the discussions of the first advisory committee shaped EIRI activities will be obvious as one reviews the minutes of the advisory committee meeting which may be found in Appendix B.

The second advisory committee meeting was similarly successful. Examples of the areas emphasized at this meeting included the need to develop explicit criteria for how sites were selected and for ensuring that sites provided high-quality services. The decision to use an independent onsite evaluator each year in assisting with the verification of treatment implementation was one way in which EIRI staff implemented this suggestion. The advisory committee again emphasized the need to raise additional money which could be used to hire a 1/4 time onsite coordinator for each of the studies to assist with verifying treatment implementation. They complimented the institute staff on the thoroughness of the plan for verifying treatment implementation, but questioned whether the plan could be fully implemented without additional resources.

Other advisory committee meetings provided feedback which was also useful. Questions were raised regarding further explication of our theoretical conceptual framework which caused the staff to do further writing in this area. Also, useful suggestions were given regarding the dissemination of research results, site management activities, and onsite evaluations.

In sum, we continue to support the notion that advisory committees are essential to large-scale research efforts and that they provide a cost-effective means of receiving input from various constituent groups.

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APPENDICES

APPENDIX A

DISSEMINATION ACTIVITIES

DISSEMINATION ACTIVITIES

BOOKS, CHAPTERS

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PRESENTATIONS

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Barnett, W. S., & Escobar, C. M. (1987, May). The costs and benefits of early intervention: Implications of recent legislation. Paper presented at the Dissemination Conference of the Early Childhood Research Institutes, Washington, DC.

Barnett, W. S., & Escobar, C. M. (1988, August). Time use, well-being, and function in families of children with Down syndrome. Paper presented at the International Association for the Scientific Study of Mental Deficiency, Dublin, Ireland.

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Behl, D. (1987). Bridging the gap between assessment and instruction. National Head Start Association Conference, New Orleans.

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Boyce, G. C. (1990, October). Time use and attitudes among siblings of children with and without Down syndrome. Paper presented at the 18th Annual Convention of the National Down Syndrome Congress, Memphis, TN.

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Casto, G. (1986, May). The efficacy of early intervention with Down syndrome preschoolers. Paper presented to the American Association of Mental Deficiency, Denver, CO.

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Casto, G. (1986, June). Long-term effectiveness of early intervention in Down syndrome. Paper presented at the Second Annual Research and Practice in Down Syndrome, Logan, Utah.

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Casto, G. (1988, February). Home visitor programs: Evidence of effectiveness. Paper presented at the National Conference on Family Support in the Home, Honolulu, HI.

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Casto, G. (1989, October). Home visitor programs. Paper presented at the American Association of University Affiliated Programs, Baltimore, MD.

Casto, G., & Barnett, W. S. (1987, March). Economic analysis of early intervention. Invited presentation at the 19th Banff International Conference on Behavioral Science, Banff, Alberta, Canada.

Casto, G., Saylor, C., Huntington, L., White, K. R., & Elksnin, N. (1989, August). Characteristics of parents and infants: Predicting benefits from early intervention. Paper presented at the American Psychological Association Conference, New Orleans, LA.

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Casto, G., Myette, B., & Pezzino, J. (1986, May). The efficacy of Cost-effectiveness of early intervention for handicapped and language disordered children. Paper presented at the annual Montana symposium on Early Education and the Exceptional Child, Billings.

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Cohen, A. J., Carlson, B., Gainer, S. C., Calder, J., & Innocenti, M. S. (1988, November). Emerging legal issues in specialized child care programs. Paper presented at the National Association for the Education of Young Children Conference, Anaheim, CA.

Elksnin, N., Imm, P., Koehler, Z., Wilfong, E., Saylor, C., & Brown, F. R. (1990, March). Comparison of parental reported adaptive behavior and cognitive development of young NICU graduates. Paper presented at the Southeastern Psychological Association meeting, Atlanta, GA.

Elksnin, N., & Saylor, C. F. (1989, April). High risk infants and their families: New challenges for assessment and intervention. Presented at the South Carolina Association of School Psychologists meeting Myrtle Beach, SC.

Escobar, C. M. (1988, January). Transportation costs and options for preschool children with handicaps in the state of Utah. Paper presented to the Utah State Legislature, Salt Lake City, UT.

Escobar, C. M. (1988, March). The cost of transporting preschool children under P.L. 99-457: Utah's pilot programs. Paper presented at the Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Escobar, C. M., Barnett, W. S., & Haring, K. (1988, April). Measuring the benefits of preschool special education: The contingent valuation method. Paper presented at the American Educational Research Association Annual Conference, New Orleans, LA.

Escobar, C. M., Barnett, W. S., & Haring, K. (1988, August). A contingent valuation approach to measuring the benefits of public programs for the handicapped. Paper presented at the International Association for the Scientific Study of Mental Deficiency, Dublin, Ireland.

Escobar, C. M., & Barnett, W. S. (1986, October). Benefit-cost analysis of the Abecedarian preschool program. Paper presented at the Council for Exceptional Children, Division of Early Childhood Annual National Conference, Louisville, KY.

Escobar, C. M., & Barnett, W. S. (1987, July). A contingent valuation approach to measuring the benefits of preschool education. Paper presented at the Western Economics Association Annual Conference, Vancouver, British Columbia.

Escobar, C. M., & Barnett, W. S. (1987, November). How much do parents value early intervention: New methods and findings from benefit-cost analysis. Paper presented at the Council for Exceptional Children, Division of Early Childhood National Early Childhood Conference, Denver.

Escobar, C. M. & Goetze, L. (1990, October). Cost evaluation of early childhood intervention programs: Implications for public policy formulation. Paper presented to the Roundtable at the American Evaluation Association Annual Conference, Washington, DC.

Farran, D. C., Simeonsson, R., & Saylor, C. F. (1988, March). P.L. 99-457: Implications for Interdisciplinary Training and Research. Conversation hour at the Conference for Human Development, Charleston, SC.

Gatling, J., & White, K. R. (1987, April). The involvement of parents as a policy issue in the provision of intervention services for infants and preschoolers. Paper presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

Goetze, L., & Glover, T. (1989, March). Financing and the corporation for public broadcasting. Paper presented at the Western Political Science Association Convention.

Goetze, L. (1989, September). The economics of early intervention: Past evidence future analysis. Paper presented to the U. S. Department of Education, Logan, UT.

Goetze, L., & Escobar, C. (1990, October). The cost-effectiveness of early intervention: Factors which explain differences in cost. Poster session presented at the Annual DEC conference, Albuquerque, NM.

Goetze, L., Glover, T., & Escobar, C. (1990, October). Production function approach to estimating educational outcomes. Paper presented at the American Evaluation Association Conference, Washington, DC.

Gutshall, N. (1990, October). ESCAPE: An Eco-Behavioral System for Assessing Preschool Environments. Poster presentation at the International Early Childhood Conference of Children with Special Needs (DEC/CEC), Albuquerque, NM.

Hanson, M., Lovett, D., Escobar, C. M., Kontos, S., & Palsha, S. (1990, October). Early intervention personnel: Job qualifications, longevity, and commitment. Paper presented to the Council for Exceptional Children, Division for Early Childhood International Conference, Albuquerque, NM.

Haring, K., Behl, D., & Escobar, C. M. (1987, September). The Early Intervention Research Institute: An overview. Paper presented at the Utah State Council for Exceptional Children Fall Conference.

Hollinger, P., Wright, B., Cheeseman, N., & Innocenti, M. S. (1990, April). Pieces of the PIE (Parents Involved in Education): Parent training or parent empowerment. Paper presented at the Council for Exceptional Children, Toronto, Canada.

Huntington, L., Casto, G., & Saylor, C. F. (1990, April). Effects of early sensorimotor intervention for medically fragile infants. Presented at the International Conference for Infant Studies, Montreal, Quebec, Canada.

Immel, N., & White, K. R. (1988, November). The use of Medicaid to support early intervention programs. Paper presented at the International Early Childhood Conference on Children with Special Needs, Nashville, Tennessee.

Innocenti, M. S. (1988, March). Strategies for transition. Paper presented at Utah State Office of Education Preschool Conference, Salt Lake City, UT.

Innocenti, M. S. (1988, July). A survey of training emphases in early intervention preservice programs. Paper presented in session, Promising Practices for Preparation of Infant Personnel (Preservice) at Conference on Partnerships for Progress: Comprehensive Services for Infants & Toddlers with Special Needs and Their Families, Washington, DC.

Innocenti, M. S. (1988, August). Social skills intervention for preschoolers. Workshop presented at Utah State Office of Education, New Beginnings, New Directions Preschool Training Conference, Salt Lake City, UT.

Innocenti, M. S. (1988, March). Teaching social skills to behaviorally disordered students. Paper presented at Wind River Council for Exceptional Children, Lander, WY.

Innocenti, M. S. (1989, July). Legal rights of young children with handicaps. Workshop presented at Louisiana's Early Education Programs Conference, New Orleans, LA.

Innocenti, M. S. (1990, May). Predictive utility of general student engagement in a preschool early intervention setting. Paper presented at the Association for Behavior Analysis, Nashville, TN.

Innocenti, M. S., Behl, D., & Gutshall, N. (1990, October). A transdisciplinary consultant-based training program for migrant and/or rural head start personnel. Presentation at Symposium on Culturally Diverse Exceptional Children (DDEL/CEC), Albuquerque, NM.

Innocenti, M. S., Boyce, G., Goetze, L., Hollinger, P., & Escobar, C. M. (1990, April). Child and family effects from and costs of parent involvement curriculum. Paper presented to the National Association of School Psychologists Annual Conference, San Francisco, CA.

Innocenti, M. S., Escobar, C. M., Huh, K., & Giacovelli, C. (1990, April). Two intensities of preschool special education: A comprehensive comparison. Paper presented at the American Educational Research Association, Boston, MA.

Innocenti, M. S., & Fiechtl, B. (1988, April). Involving parents in teaching social skills to their handicapped preschoolers. Paper presented at Association for Childhood Education International, Salt Lake City, UT.

Innocenti, M. S. Fiechtl, B., & Rule, S. (1988, May). Teaching academic survival skills during group activities. Poster presented at Association for Behavior Analysis, Philadelphia, PA.

Innocenti, M. S., Summers, M., & White, K. R. (1990, April). Early intervention in the United States: Past, present, and future. Paper presented at the Council for Exceptional Children, Toronto, Canada.

Innocenti, M. S., & Huh, K. (1989, March). A comparison of two early childhood intervention programs of varying intensity. Paper presented at the American Educational Research Association, San Francisco, CA.

Keith, J. E., Escobar, C. M., Glover, T. F., & Snyder, D. L. (1986, July). Valuation an early intervention program for handicapped children. Paper presented at the Western Economics Association Annual Conference, San Francisco, CA.

Killoran, J., Innocenti, M. S., & Lacy, J. (1990, July). A system to provide preschool (0-5) special education certification in Utah: A collaboration between education, health, and universities. Poster presented at Partnerships in Progress IV, Washington, DC.

Lowitzer, A. C. (1987, April). Budgetary and demographic variables associated with the classification practices of state mental retardation program offices. Paper presented at the Society for Disability Studies, El Paso, TX.

Lowitzer, A. C. (1988, April). A comparison of oral/auralism versus total communication in the education of hearing impaired preschoolers. Paper presented at the AERA conference, New Orleans, LA.

Lowitzer, A. C. (1989, April). Family type, sources of support, and changes in stress among families of preschool children. Paper presented at the Society for Research in Child Development, Kansas City, MO.

Lowitzer, A. C. (1989, April). Family demographics, family function, and parent involvement. Paper presented at the Society for Research in Child Development, Kansas City, MO.

Lowitzer, A. C. (1989, May). Family type, parent involvement, and stress among families of preschool children with handicaps. Paper presented at the American Association on Mental Retardation 113th Annual Meeting, Chicago, IL.

Lowitzer, A. C. (1990, April). A look at the costs and benefits of early intervention with handicapped children and their families. Paper presented at the 11th Annual Conference of the Young Adult Institute, New York.

Mastropieri, M. A., White, K. R., & Casto, G. (1985, April). The efficacy of early intervention for handicapped and disadvantaged: A meta-analysis. Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Mauk, G. W. & White, K. R. (1990, May). Retrospective study of Identification of Hearing Impairment in Children. Paper presented at the annual meeting of the Utah Speech-Language Association, Park City, Utah.

Mott, S. E., White, K. R., Pezzino, J., & Behl, D. (1987, May). Longitudinal studies of the costs of early intervention with handicapped children. Paper presented at the Focusing on the Future: Linking research, policy and practice in early intervention Conference, Arlington, VA.

Pezzino, J. (1988, May). A critical review: Cost-effectiveness analysis in human service research. Paper presented at the Fourth Annual Montana Symposium on Early Education and the Exceptional Child, Billings, MT.

Pezzino, J., Behl, D., White, K. (1987). Verification of treatment implementation in early intervention efficacy research. DEC National Early Childhood Conference on Children with Special Needs, Denver.

Pope, J. A., & Saylor, C. F. (1987, November). Maximizing compliance in early intervention programs for handicapped infants and preschoolers. Paper presented at the Council for Exceptional Children-Division of Early Childhood Meeting, Denver, CO.

Saylor, C. F. (1986, March). New directions in pediatric psychology: Risk prediction and prevention. Symposium presentation at the Southeastern Psychological Association Meeting, Orlando, FL.

Saylor, C. F. (1987, November). Symposium: Practical issues in early intervention research. Council for Exceptional Children-Division of Early Childhood Meeting, Denver, CO.

Saylor, C. F. (1988, August). Symposium. Presented at American Psychological Association meeting, Atlanta, GA.

Saylor, C. F. (1989, February). Premature infants: A new generation of special needs children symposium. Presented at the South Carolina Council for Exceptional Children, Charleston.

Saylor, C. F. (1989, March). Early intervention with medically fragile infants and their families symposium. Presented at Council for Exceptional Children, San Francisco, CA.

Saylor, C. F. (1989, May). Beginning the business of preschool services: Psychologists and P.L. 99-457. Presented at the South Carolina Psychological Association, Hilton Head.

Saylor, C. F. (1989, August). Understanding high risk parent-infant dyads-current research. Presented at American Psychological Association meeting, New Orleans, LA.

Saylor, C. F., & Brandt, B. J. (1985, August). Concurrent validity of the Minnesota Child Development Inventory with Infants. Paper presented at the American Psychological Association Meeting, Los Angeles, CA.

Saylor, C. F., & Casto, G. (1990, April). PICIS prediction of intervention success for IVH babies. Presented at the International Conference for Infant Studies, Montreal, Quebec, Canada.

Saylor, C., Casto, G., & Millard, J. (1987, March). Initial outcome for an early intervention program for low birthweight infants with intraventricular hemorrhage. Presented at Southeastern Psychological Association Meeting, Atlanta, GA.

Saylor, C. F., & Levkoff, A. H. (1987, March). Early intervention with high risk infants. Presented at the South Carolina Perinatal Association meeting, Columbia, SC.

Saylor, C. F., Pappu, L., & Shoemaker (1989, April). Social, cultural and educational factors in the development of high risk premature infants. Presented at the Society for Research in Child Development, Kansas City, KS.

Saylor, C. F., & Pope, J. A. (1988, August). Intervention with at-risk infants and families: Age-at-start comparison. Symposium presented at American Psychological Association meeting, Atlanta, GA.

Saylor, C. F., & Shoemaker, O. S. (1987, August). Concurrent validity of the MCDI with "high risk infants." Presented at the American Psychological Association meeting, New York.

Shoemaker, O. S., Saylor, C. F., & Aikman, K. (1988, March). Assessment of behavior problems in retarded preschoolers, utility of the Achenbach scales. Presented at Southeastern Psychological Association meeting, New Orleans, LA.

Summers, M., Huntington, L., Pope, Jr., & Saylor, C. F. (1988, March). Coding interactions between handicapped infants and their mothers: Preliminary comparison of five systems. Presented at Southeastern Psychological Association meeting, New Orleans, LA.

Taylor, M. J., & White, K. R. (1990, April). An evaluation of alternative methods for computing standardized mean difference effect sizes. Paper presented at the annual meeting of the American Education Research Association, Boston, MA.

Taylor, M. J., & White, K. R. (1990, April). Stability and Bias in Glass' Standardized Mean Difference Effect Size: A Monte Carlo Study. Paper presented at the annual meeting of the American Educational Research Association, Boston, Massachusetts.

Vohr, B. R., White, K. R., Kemp, D., & Blackwell, P. (1990). Auditory Screening for Neonates Using Otoacoustic Emissions. Paper presented at the XXth International Congress of Audiology Tenerife, Canary Islands, Spain.

Welge, P., Bastien, M., Innocenti, M. S., & Atwater, J. (1988, November). Preparing paraprofessionals to deliver early intervention services in inner-city settings: A comparison of two training models. Paper presented at the International Early Childhood Conference on Children with Special Needs (CEC/DEC), Nashville, TN.

White, K. R. (1985, November). The role of research in formulating public policy about early intervention. Paper presented to Child and Youth Research Luncheon Forum, United States Congress, Washington, DC.

White, K. R. (1985, October). How research findings should affect policy decisions about early intervention. Paper presented to the Utah State Board of Education, Salt Lake City, UT.

White, K. R. (1985, October). The efficacy of early intervention. Invited address at the Conference on Behavioral and Educational Intervention with High-Risk Infants, National Institute of Child Health and Human Development, Bethesda, MD.

White, K. R. (1985, October). Efficacy and cost-effectiveness in early intervention: Implications for practice. Invited address at the National Early Childhood Conference on Children with Special Needs, Denver, CO.

White, K. R. (1986, October). Conducting longitudinal research in early intervention. Invited paper presented at the National Early Childhood Conference on Children with Special Needs, Louisville, KY.

White, K. R. (1986, October). The benefits of group research designs in special education research. Paper presented at the National Early Childhood Conference on Children with Special Needs, Louisville, KY.

White, K. R. (April 1987). Interpreting early intervention research: Implications for future research and policy. Paper presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

White, K. R. (1987). Understanding the potential and pitfalls of early intervention: Lessons from research. Invited address to the annual meeting of the Phoenix Society of Pediatrics, Phoenix, AZ.

White, K. R. (1987). Methodological issues in research integration of special education research. Paper presented at the annual meeting of the Council on Exceptional Children, Chicago, IL.

White, K. R. (1987). Early intervention with hearing impaired children. Invited presentation to the SKI*Hi Institute National Conference, Logan, UT.

White, K. R. (1987). Longitudinal research on the effects and costs of early intervention with handicapped children. Invited paper to be presented at the National Early Childhood Conference on Children with Special Needs, Denver, CO.

White, K. R. (1988, March). *Using systematic variation to improve intervention programs*. Paper presented at the Utah Preschool Education Conference, Salt Lake City, UT.

White, K. R. (1988, April). *Current policies and procedures in serving birth to two handicapped children*. Keynote address to the annual meeting of the Minnesota Administrators of Special Education, Shakopee, MN.

White, K. R. (1988, July). *Financing early intervention programs*. Paper presented at Partnerships for Progress II (a national conference on Part H of P.L. 99-457), Washington, D.C.

White, K. R. (1988, December). *Financing early intervention programs*. Presentation to Nebraska State Agency directors and staff members.

White, K. R. (1988, November). *Financing early intervention under P.L. 99-457: Issues and challenges*. Keynote address to the National Center for Clinical Infant Programs Zero to Three Conference, Washington, D.C.

White, K. R. (1988, November). *Using Medicaid and other third party payments to finance early intervention programs*. Paper presented to the National Center for Clinical Infant Programs Zero to Three Conference, Washington, D.C.

White, K. R. (1988, November). *The ABCs of using Medicaid and third party payments to support services for handicapped children and youth*. Plenary session presented to the annual meeting of the National Association of State Directors of Special Education (NASDSE), Minneapolis, Minnesota.

White, K. R. (1988, August). *Using comparative experimental research to improve early intervention services*. Paper presented at the 8th Congress of the International Association for the Scientific Study of Mental Deficiency, Dublin, Ireland.

White, K. R. (1989). *Implementing Early Intervention Programs under P.L. 99-457. Promises and Perils*. Keynote address presented to the Ohio Department of Education Conference, Every Child a Promise, Columbus, Ohio.

White, K. R. (1990, July). *Follow-up studies of the effects of early intervention with handicapped children*. Paper presented as a part of an initial symposium of the National HCEEP Directors Meeting sponsored by the Office Special Education and Rehabilitative Services, U. S. Department of Education, Washington, D.C

White, K. R. (1990, July). *Using Third-Party Payments to Support the Financing of Early Intervention Programs*. Paper presented at the annual meeting of Partnerships in Progress IV: A National Early Intervention Conference. Washington, D.C.

White, K. R. (1990, September). *Can the Developmental Functioning of Handicapped and At-Risk Children be Enhanced by Early Intervention Programs?: Results from a Series of Longitudinal Research Studies*. Paper presented at the International Symposium, Child Care in the Early Years: Research and Future Prospects. Lausanne, Switzerland.

White, K. R. (1990, September). *Can the developmental functioning of handicapped children be enhanced by early intervention?* Paper presented as the Ellermann Memorial Lecture, University of Bern, Bern, Switzerland.

White, K. R. (1990, September). *Rationale, design, and results of the Longitudinal Studies of the effects and costs of early intervention*. Invited paper presented at the Children's Hospital University of Basel, Basel, Switzerland.

White, K. R. (October 19, 1990). *Analysis versus advocacy in setting social policy*. Symposium paper presented at the annual meeting of the American Evaluation Association. Washington, D.C.

White, K. R. (October 9, 1990). *The Rhode Island Hearing Assessment Project: A clinical trial of the use of otoacoustic emissions to identify hearing loss in neonates*. Invited paper presented at The Otoacoustic Emission and Early Identification of Hearing Impairment Symposium sponsored by the National Institute of Disability and Rehabilitation Research, Providence, Rhode Island.

White, K. R., Casto, G., & Barnett, S. (1987, May). *Twenty years of early intervention efficacy research: The implications for research, policy, and practice*. Paper presented at Focusing on the Future: Linking research, Policy and Practice Conference, Arlington, VA.

White, K. R., Casto, G., Goetze, L., & Escobar, C. M. (1990, July). *Longitudinal research in early intervention: Implications for policy and practice*. Workshop conducted at the Annual Partnerships for Progress Conference, Washington, DC.

White, K. R., Casto, G., & Innocenti, M. (1990, December). *The effects and costs of early intervention with handicapped children: Results of sixteen randomized longitudinal studies*. Symposium presented at the National HCEEP Directors Meeting sponsored by the Office of Special Education and Rehabilitative Services, U. S. Department of Education, Washington, D.C.

White, K. R., & Mastropieri, M. A., & Scruggs, T. E., (1987, May). *Early intervention efficacy research: The past as prologue*. Paper presented at the Focusing on the Future: Linking Research, Policy, and Practice in Early Intervention Conference, Arlington, VA.

White, K., Mott, S., Pezzino, J., & Behl, D. (1987). *Longitudinal studies of the effects and costs of early intervention with handicapped children*. Focusing on the Future Conference, Early Childhood Research Institute, Washington, D.C.

White, K. R., Taylor, M., Moss, V. (1989). *Benefits of Parent Involvement in Early Intervention: Does Research Support Current Practice*. Paper presented at the Biennial Meeting of the Society of Research in Child Development, Kansas City.

Wilfong, E., Elksnin, N., & Saylor, C. (1989, March). *Mothers of infants with intraventricular hemorrhage: Influences on their responsitivity in play interactions*. Presented at the Southeastern Psychological Association meeting, Washington, DC.

DISSERTATIONS/THESES

Caracter-Murchison, J. (1988). *Family and environmental characteristics as they relate to the language development of hearing impaired children*. Unpublished Masters Thesis, Utah State University.

Clarkson, D. R. (1989). *The usefulness of the DIAL-R as a screening tool to identify Native American preschoolers in need of special services*. Unpublished doctoral dissertation, Utah State University.

Corey, W. F. (1988). A preschool-age neurodevelopmental comparison of full-term and low birthweight infants with and without intraventricular hemorrhage. Unpublished doctoral dissertation, Utah State University.

Elghammer, R. (1988). Maternal, obstetric, and neonatal correlates of short-term neurodevelopmental outcome in newborn infants with intraventricular hemorrhage. Unpublished doctoral dissertation, Utah State University.

Goodwin, G. (1986). A neuropsychological approach for differentiating the residual effects of neonatal intraventricular hemorrhage. Unpublished doctoral dissertation, Utah State University.

Innocenti, M. S. (1991). Three studies examining the construct of intensity as an intervention variable in early intervention programs for children with disabilities. Unpublished doctoral dissertation, Utah State University.

McCoun, M. R. (1988). The comparison of home-based, parent-centered speech therapy services with center-based, child-centered speech therapy services with moderately speech disordered 3- and 4-year-old children. Unpublished doctoral dissertation, Utah State University.

Millard, J. (1987). The effect of an early sensorimotor intervention program on the development of infants with perinatal intraventricular hemorrhage. Unpublished doctoral dissertation, Utah State University.

Poirier, B. M. (1989). The effectiveness of language intervention with preschool handicapped children: An integrative review. Unpublished doctoral dissertation, Utah State University.

Shamaly, J. J. (1988). The effects of teacher training vs. teacher and parent training on the aggressive behavior of preschoolers. Unpublished doctoral dissertation, Utah State University.

Wazlavek, B. (1988). The effects of participation in a development group upon the psychological adjustment of teen mothers. Unpublished doctoral dissertation, Utah State University.

Wingate-Corey, T. (1988). A preschool assessment of low birth weight infants with and without perinatal intraventricular hemorrhage. Unpublished doctoral dissertation, Utah State University.